MINI
DEVELOPMENT
BOARD

PIC
16F877A

USERS GUIDE

make your own
intelligent embedded world . . .

rhydoLABZ™

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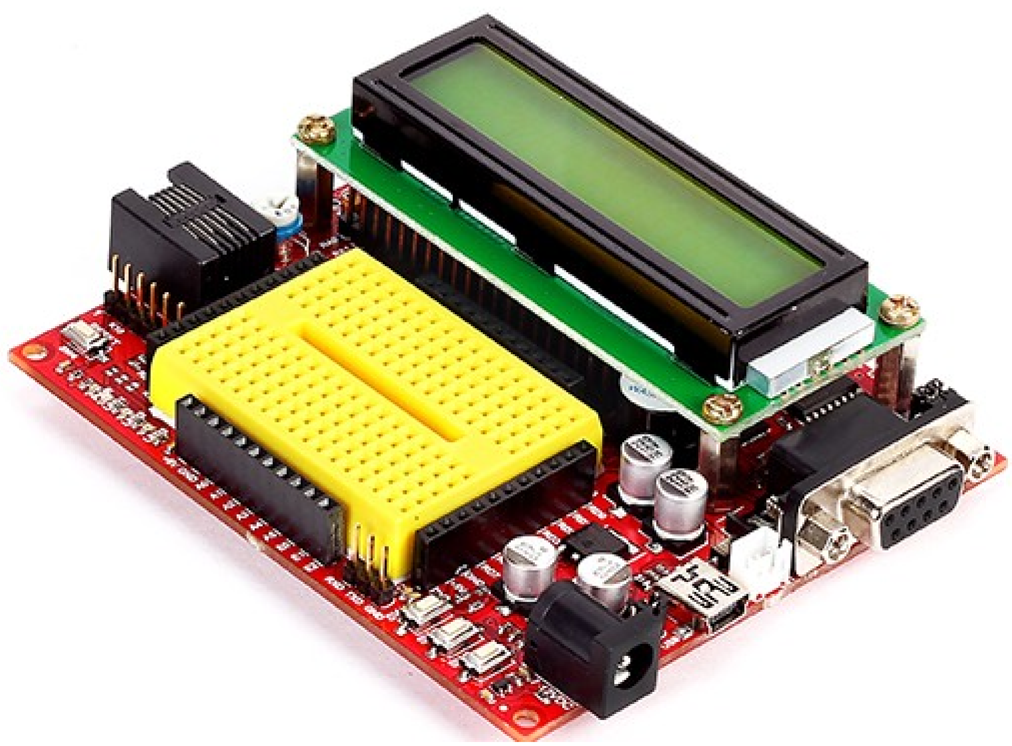
OVERVIEW

The PIC16F877A Development Board(Mini) from rhydoLABZ can be used to evaluate and demonstrate the capabilities of Microchip PIC16F877A microcontroller. The board is designed for general purpose applications and includes a variety of hardware to exercise microcontroller peripherals. Ideally suitable for training and development purposes. The board provides the basic environment for a PIC microcontroller to run. All ports, 5V,GND,3V3 are available on 40 pin male berg strip and 44 pin female berg strip. We can easily attach a mini bread board on this development board. Now all the PORTs of microcontroller along with power pins are available at the four side of the mini bread board where as we can design the rest of our project.



1.1. CONTROLLER SPECIFICATION

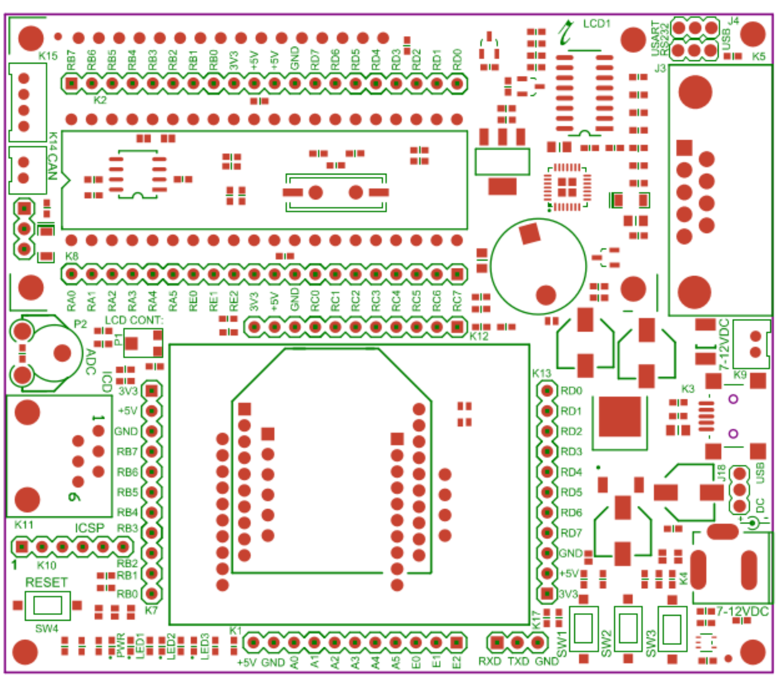
PIC microcontrollers are manufactured by Microchip Technology Inc. The PIC microcontroller family is based on modified Harvard architecture. Features of PIC16F877A microcontrollers are

1. Only 35 single-word instructions to learn
2. All single-cycle instructions except for program branches, which are two-cycle
3. Operating speed:
   - DC – 20 MHz clock input
   - DC – 200 ns instruction cycle
4. Up to 8K x 14 words of Flash Program Memory
5. Up to 368 x 8 bytes of Data Memory (RAM)
6. Up to 256 x 8 bytes of EEPROM Data Memory
7. Pinout compatible to other 28-pin or 40/44-pin PIC16CXXX and PIC16FXXX microcontrollers
8. Timer0: 8-bit timer/counter with 8-bit prescaler
9. Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock
10. Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler .
11. Two Capture, Compare, PWM modules
    - Capture is 16-bit, max. resolution is 12.5 ns
    - Compare is 16-bit, max. resolution is 200 ns
    - PWM max. resolution is 10-bit
12. Synchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™(Master/Slave)
13. Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection
14. Parallel Slave Port (PSP) – 8 bits wide withexternal RD, WR and CS controls (40/44-pin only)
15. Brown-out detection circuitry for Brown-out Reset (BOR)
16. 10-bit, up to 8-channel Analog-to-Digital Converter (A/D)
17. Brown-out Reset (BOR)
18. Analog Comparator module with:
    - Two analog comparators
    - Programmable on-chip voltage reference (VREF) module
    - Programmable input multiplexing from device inputs and internal voltage reference
    - Comparator outputs are externally accessible
19. 100,000 erase/write cycle Enhanced Flash program memory typical
20. 1,000,000 erase/write cycle Data EEPROM memory typical
21. Data EEPROM Retention > 40 years
22. Self-re programmable under software control
23. In-Circuit Serial Programming™ (ICSP™) via two pins
24. Single-supply 5V In-Circuit Serial Programming
25. Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
26. Programmable code protection
27. Power saving Sleep mode
28. Selectable oscillator options
29. In-Circuit Debug (ICD) via two pin
30. Low-power, high-speed Flash/EEPROM technology
31. Fully static design
32. Wide operating voltage range (2.0V to 5.5V)
33. Commercial and Industrial temperature ranges
34. Low-power consumption

1.2. KEY FEATURES OF PIC16F877A DEVELOPMENT BOARD-MINI

1. Compact and Ready to use
2. Professional EMI/RFI Complaint PCB Layout for Noise Reduction
3. High Quality Two layer PTH PCB
4. The board is moderate in size
5. Board supports 40 pin PIC microcontrollers
6. No separate power adapter required(USB power source)
7. RMC Connector and barrel jack connector for external power supply (with jumper select option)
8. RS232 and CP2102 Interface (for direct connection to PC's serial/USB port)
9. On board two line LCD display(2x16)
10. On board Reset button
11. Built in potentiometer interface for ADC
12. On board Temperature Sensor Interface
13. On board Buzzer Interface
14. On board JTAG connector for Debugging/Programming
15. On board ICSP connector for Debugging/Programming
16. On board 20 MHz crystal oscillator
17. On board DB9 female connector
18. On board mini USB connector
19. On board 5V UART pins.
20. On board 3V3 UART pins.
21. There is a provision to interface ZigBee module
22. There is a provision to interface RFID module
23. There is a provision to interface servomotor
24. There is a provision to attach mini bread board
25. Male and Female berg strips to access port pins

LAYOUT OF PIC16F877A DEVELOPMENT BOARD-MINI



PACKAGE CONTENTS

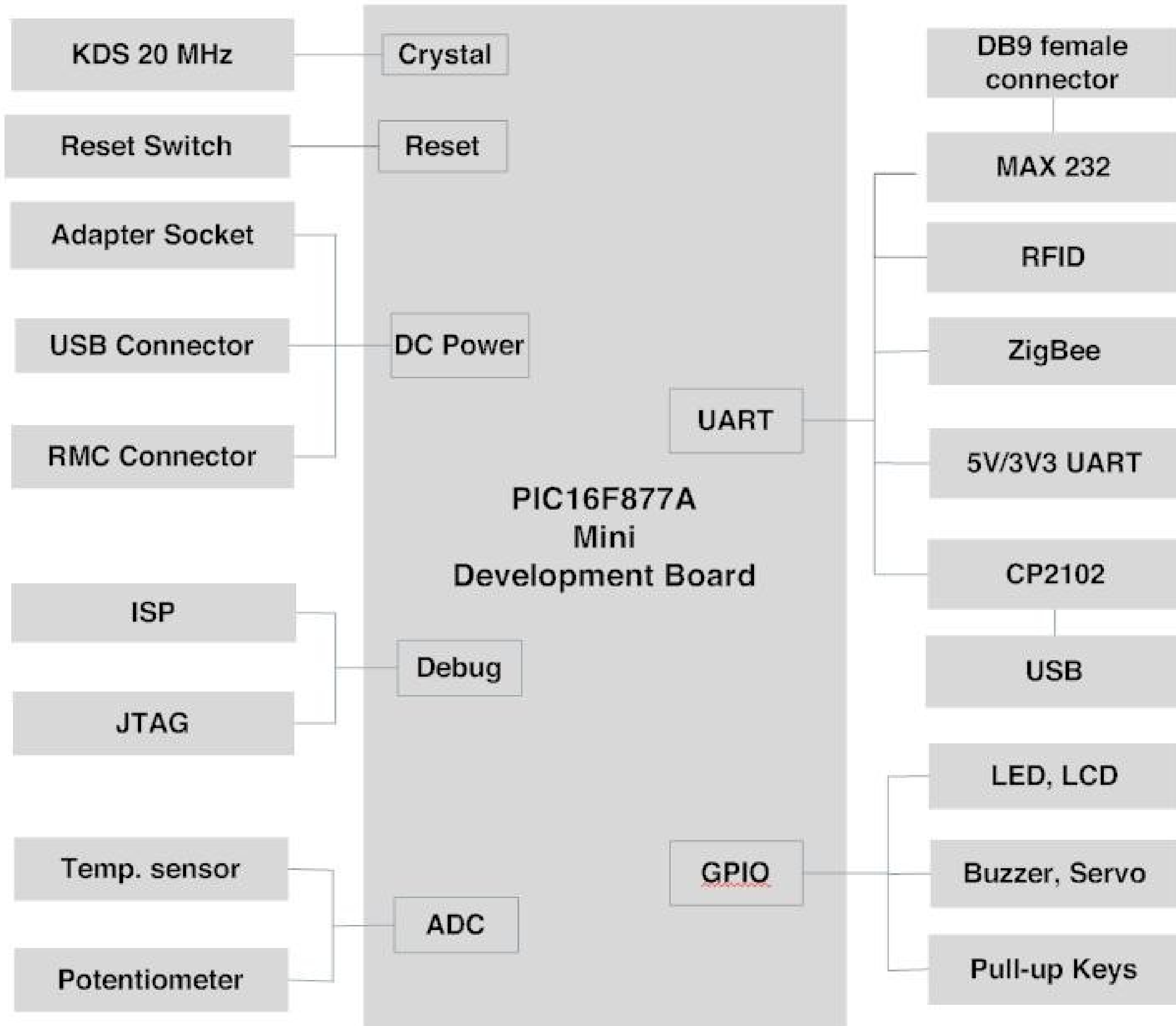
- Fully Assembled and Tested PIC16F877A Development board-mini
- RS232 Serial Cable
- USB cable A to B
- Software CDROM with
  - User Manual
  - Schematic
  - Programming Software
  - Sample Hex Code
  - Example Codes for
    - *Led Blinking*
    - *LCD Display*
    - *Led Control with Timer*
    - *UART Communication*
    - *PWM Generation*
    - *Buzzer Interfacing*
    - *ADC Interfacing*

SYSTEM SPECIFICATION

- Power Supply via
  1. USB cable(5V)
  2. DC barrel jack connector(7-12V)
  3. RMC connector(7-12V)
- 50mA in idle state(when On-board modules are inactive)
- Dimension is 82.34mm x 96.08mm
- Weight is ~92g

HARDWARE INTRODUCTION

2.1. BLOCK DIAGRAM



2.2. INTERFACE OVERVIEW

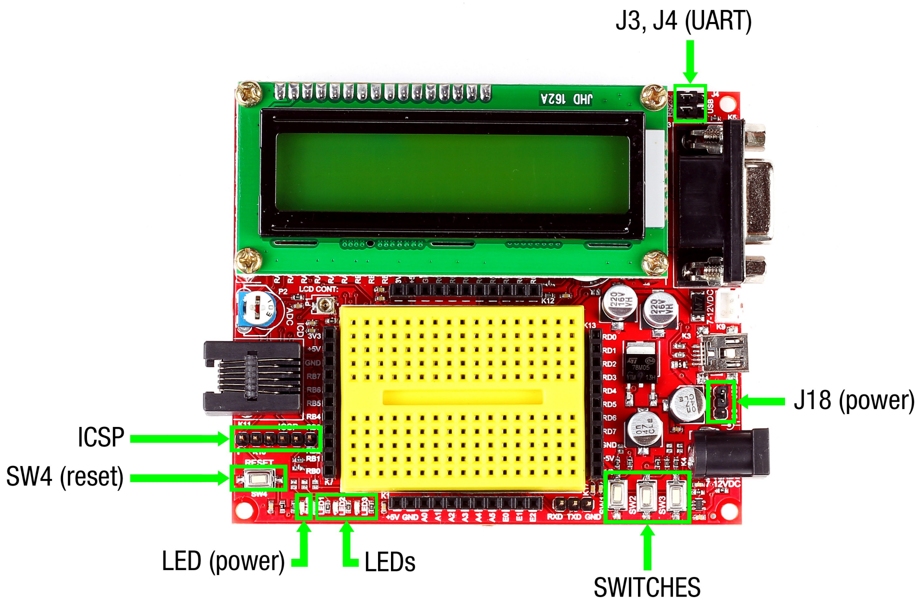


Illustration 1:Top view of the Development board -Mini

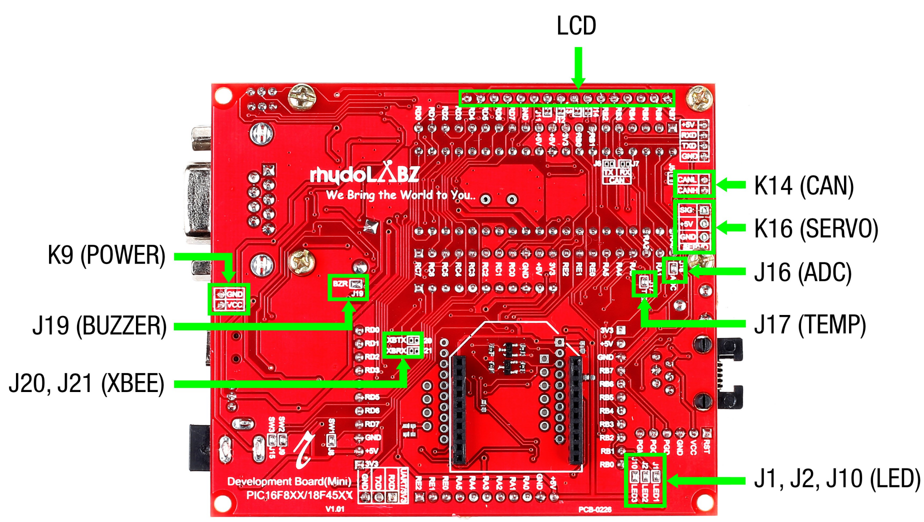


Illustration 2:Bottom view of the Development board -Mini

PERIPHERALS	DESCRIPTIONS
U1	POWER SUPPLY- LD1117 3V3
U2	RS232 - MAX232
U3	VOLTAGE REGULATOR- LM7805
U4	CONTROLLER - PIC16F877A
U5	USB Interface-CP2102
U6	MCP2551(used only in PIC18F4580 dev board)
U7	TEMPERATURE SENSOR -MCP9700
U8	Connector for ZIGBEE MODULE
P1	LCD Contrast Control Knob
P2	ADC Knob
SW4	Reset switch
SW1,SW2,SW3	Pull up key
LED1,LED2,LED3	3 LEDs connected to the PORTB pins
LCD	16X2 Monochrome LCD
K11	RJ-11 Connector (ICSP)
K3	USB Socket
K9	RMC connector
K5	DB9 Female Connector
K10	ICSP Connector
K1,K2,K7,K8,K12,K13	Controller Port pins
K14	CAN Interface (used only in PIC18F4580 dev board)
K15 & K17	5V UART & 3V3 UART
K16	Connector for servomotor

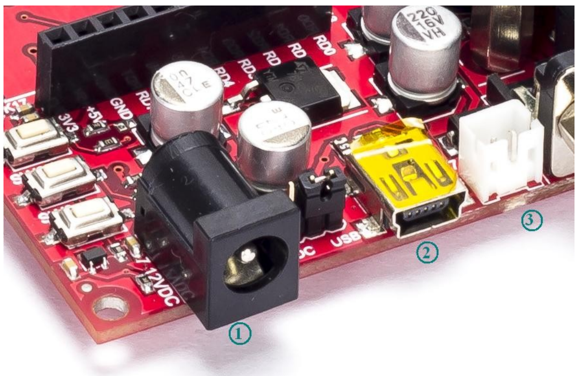
JUMPER No.	DESCRIPTIONS	SET OPTIONS	SETTINGS DESCRIPTION
J18	Power Supply Options	1-2	Select USB power
		2-3	Select external DC power
J11, J12, J13, J14	LCD	Short access	Enables LCD for 8-bit mode
J16	Potentiometer	Short access	Enables ADC connection via POT
J17	Temperature Sensor	Short access	Enables temp sensor connection
J1, J2, J10	LED	Short access	Enables LED connection
J8,J9,J15	Pull-Up Key	Short access	Enables Pull-Up Key connection
J19	Buzzer	Short access	Enables buzzer connection
J20,J21	ZigBee	Short access	Establish ZigBee connection
J3, J4	USART	1-2	RS232 Connection
		2-3	USB Connection

2.3. POWER SUPPLY

PIC16F877A Board has three power supply options as follows:

- Through the on board USB port (5V)
- Through RMC Connector (7V - 12V External DC Power Supply)
- Through Barrel Jack Connector (7V - 12V External DC Power Supply)

Note: For power selection, jumper (J18) must be in position.



1. Barrel Jack Connector
2. USB port
3. RMC Connector

Illustration 3: Connectors for power supply

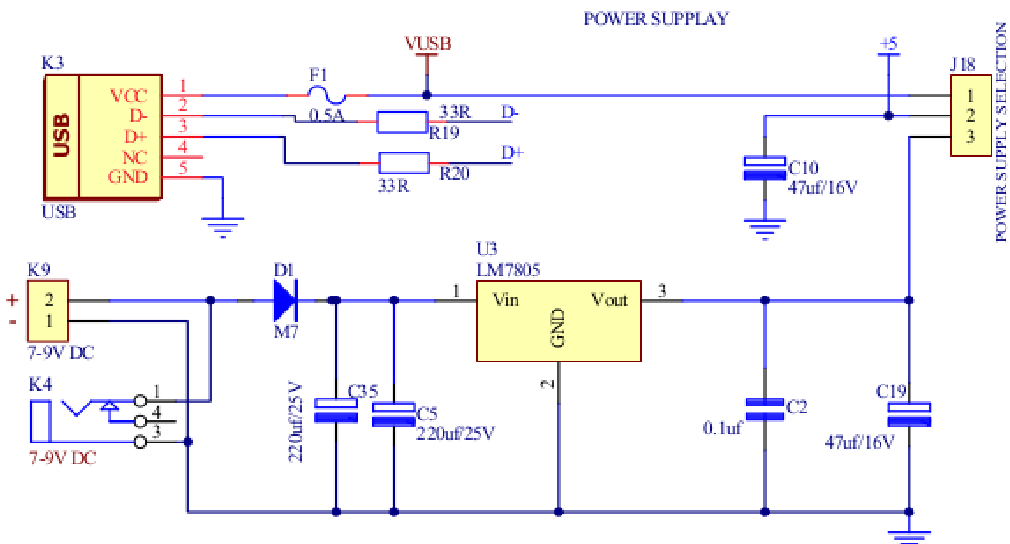
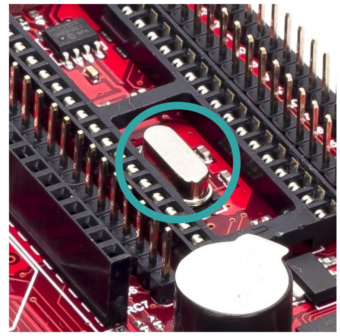


Illustration 4: Power supply source connection schematic

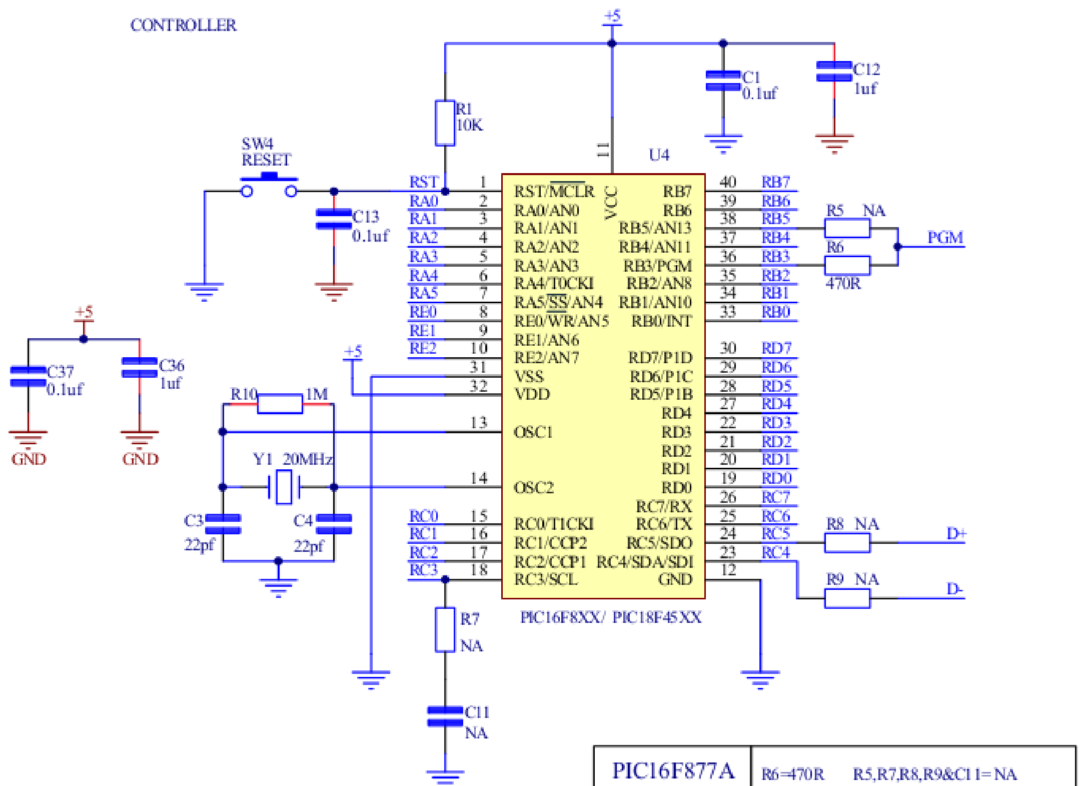
2.4. CLOCK SOURCE

PIC microcontrollers normally use a quartz crystal for the purpose of providing clock frequency. Clock source for PIC16F877A Development board -Mini:

- 20 MHz Crystal as the MCU clock source



2.5. MICROCONTROLLER PINOUT



PIC16F877A	R6=470R	R5,R7,R8,R9&C11=NA
PIC18F4520	R5=470R	R6,R7,R8,R9&C11=NA
PIC18F4550	R6=NA	R8,R9=22R R5=470R R7=0R C11=470nf
PIC18f4580	R5=470R	R6,R7,R8,R9&C11=NA

*NA- Not applicable

Illustration 4: Microcontroller pinout schematic

2.6. LED INTERFACE

LED’s are semiconductor diodes, electronic devices that permit current to flow in only one direction. The diode is formed by bringing two slightly different materials together to form a PN junction. In a PN junction, the P side contains excess positive charge ("holes") while the N side contains excess negative charge (“electrons”). When a forward voltage is applied to the semiconducting element forming the PN junction, electrons move from N area toward P area and holes move from P area toward N area. Near the junction, the electrons and holes combine. As this occurs, energy is released in the form of light that is emitted by the LED. The material used in the semi conducting element of an LED determines its color. LED’s are the simplest devices to test port functioning.

There are 3 LED available in our development board. General Purpose Input Output RB1,RB2 and RB3 are interfaced with LEDs via jumpers J1,J2 and J10 respectively.

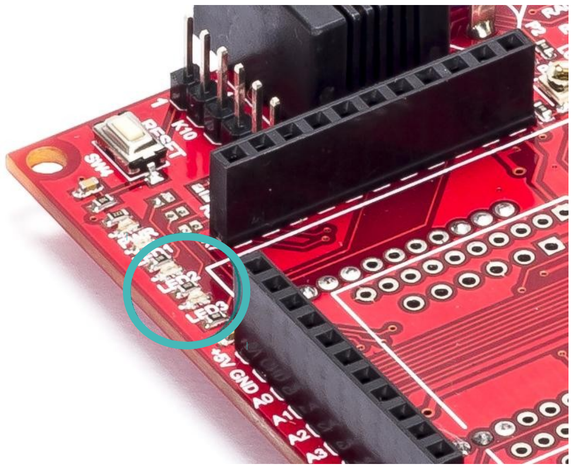


Illustration 5: LEDs on board

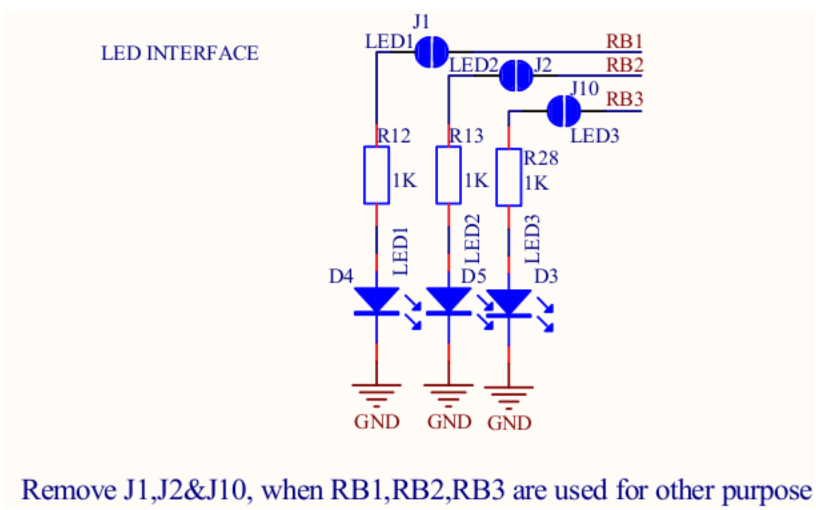


Illustration 6:LED connection schematic

2.7. LCD INTERFACE

The display is a standard 16x2 LCD which displays 2 lines of 16 characters. Each character is 40 pixels, making it 1280 pixels overall. The display receives ASCII codes for each character at the data inputs(D0-D7). The data is presented to the display inputs by MCU, and latched in by triggering the E(Enable) input. The RW(Read/Write) line can be tied low(write mode),as the LCD is receiving data only. The RS(Register Select) inputs allows commands to be send to the display. RS select command/data register. The display itself contains a microcontroller, the standard chip in this type of display is Hitachi HD44780U. It must be initialized according to the data and display options required.

The module can be used in 4-bit or 8-bit mode. In our development board, we could use either 4-bit or 8-bit interfaces. Shorting jumpers J11, J12, J13, J14 selects 8-bit interface & if removed selects 4-bit interface. PORTD pins are used as data/command pins while PORTC pins as RS & E pin. A trimmer potentiometer is interfaced to adjust the LCD contrast to get a better view in every angle.

Note: Jumpers J11, J12, J13 & J14 will be shorted in PCB by default. If RD0, RD1, RD2 & RD3 needs to relieved from LCD connection, user needs to manually disconnect the track lying underneath these jumpers.

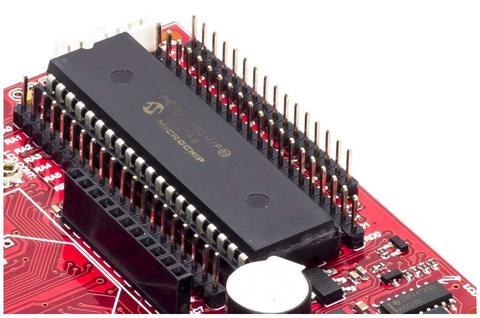


Illustration 7:LCD's male port on board

Trimmer Pot

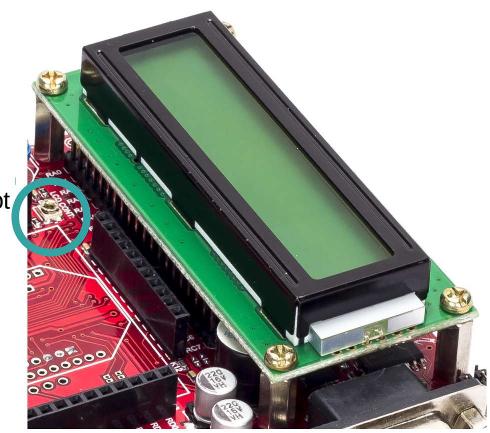


Illustration 8:16x2 alphanumeric LCD placed on board

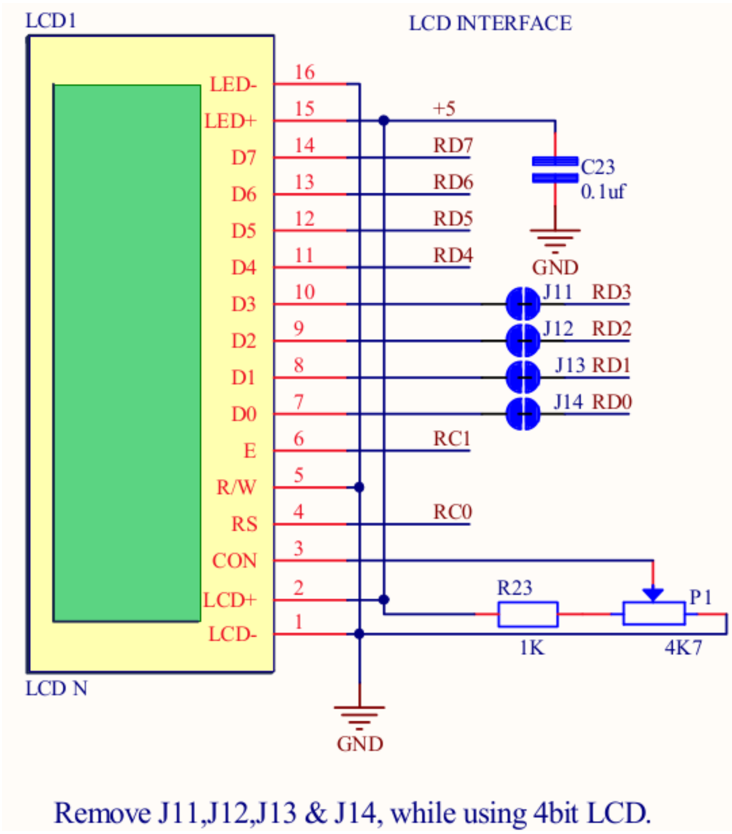


Illustration 9: LCD connection schematic

2.8. PULL-UP KEY INTERFACING

The simplest input to a microcontroller is a switch or push button. This can operate with just one additional support component, a pull-up resistor. The resistors R15, R14 and R34 are pull up resistors. The input pins RC3, RC2 and RB5 reads high value when the keys are not pressed. When the key is pressed, it connect the input pin to the ground via a small value resistor. Thus input pin get logic low value. There are 3 pull up switches in the board connected to RC2, RC3 and RB5.

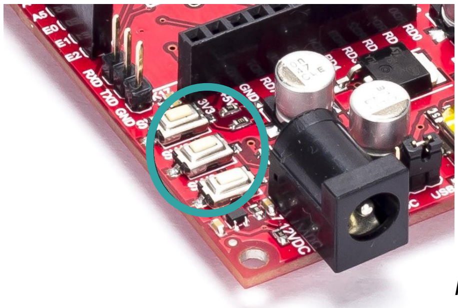


Illustration 10:Pull Up Key on board

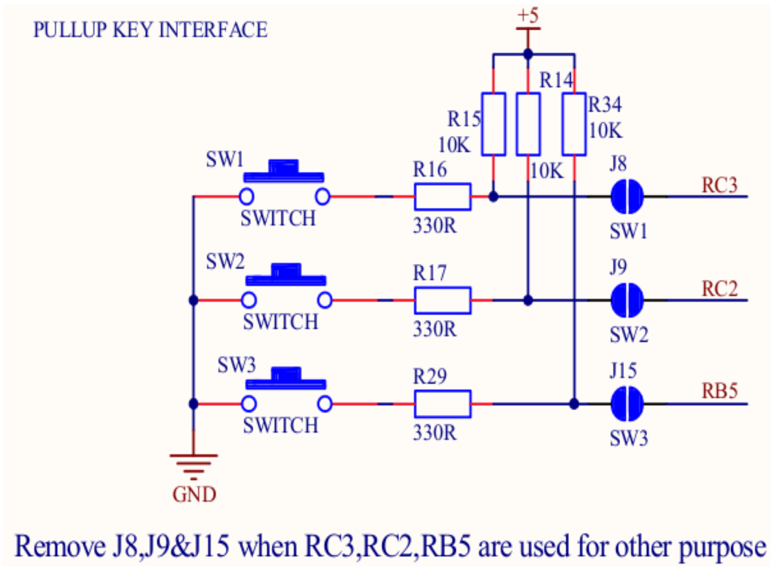


Illustration 11: Pull up key connection schematic

2.9. BUZZER INTERFACING

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles household appliances such as microwave oven or game shows. It indicates a warning in the form of a continuous or intermittent buzzing or beeping sound. Here we use a ceramic-based piezoelectric sounder with a high-pitched tone.

Illustration 12: Buzzer on board

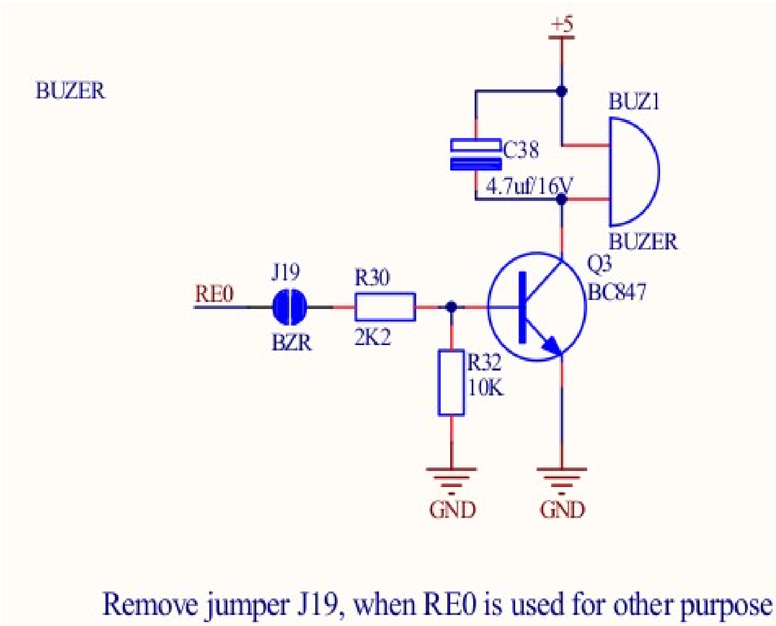


Illustration 13: Buzzer Connection Schematic

2.10. UNIVERSAL SYNCHRONOUS AND ASYNCHRONOUS RECEIVER AND TRANSMITER

Serial communication is the process of sending data one bit at a time sequentially over a communication channel. The Universal Synchronous Asynchronous Receiver Transmitter(USART) module is one of the two serial I/O modules. USART is also known as a Serial Communication Interface. The USART is highly flexible serial communication protocol.

The USART can be configured as a full duplex asynchronous system that can communicate with peripheral devices such as CRT terminals and personal computers, or it can be configured as a half duplex synchronous system that can communicate with peripheral devices such as A/D or D/A integrated circuits, serial EEPROMs etc.

Note- The baud rate range for the PIC microcontroller is 300 to 115200.

The main features are:

- Full duplex operations
- Asynchronous or synchronous operation
- Master or slave clocked synchronous operation
- High resolution Baud Rate generator
- Odd or even parity check supported by hardware
- Data Over-Run detection
- Framing Error Detection
- Noise filtering includes false start bit detection and digital low pass filter
- Multiprocessor communication mode
- Double speed asynchronous communication mode

RS-232 Interfacing

RS-232 is a standard communication protocol for linking computer and its peripheral devices to allow serial data exchange. Since RS-232 communication voltage levels are different than microcontroller logic levels, it is necessary to use a RS-232 Transceiver circuit. Here we use serial driver IC MAX232 for interfacing RS-232 with microcontroller UART module. A DB9 female connector is provided to make direct connection with the serial port of a device or PC.

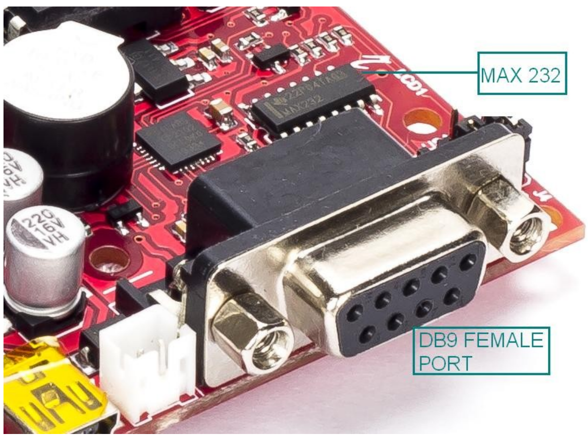


Illustration 14: RS232 Module on board

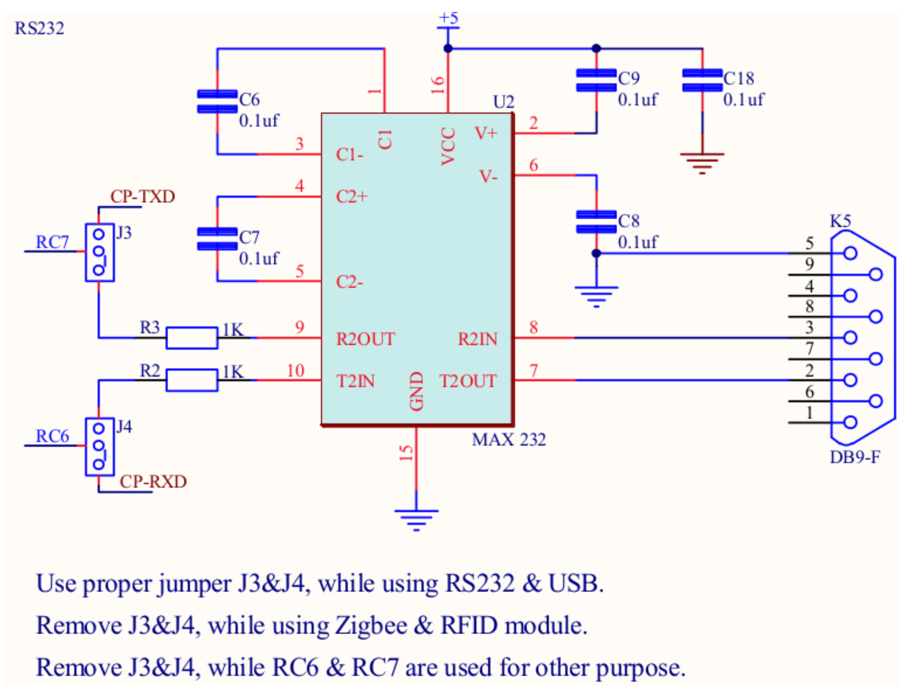


Illustration 15:RS232 Module Schematic

CP2102 USB Interfacing

The CP2102 is a highly-integrated USB to UART Bridge Controller providing a simple solution for updating RS-232 designs to USB using a minimum of components and PCB space. The CP2102 includes a USB 2.0 full-speed function controller, USB transceiver, oscillator, EEPROM and asynchronous serial data bus (UART) with full modem control signals in a compact 5 x 5 mm MLP-28 package. No other external USB components are required.

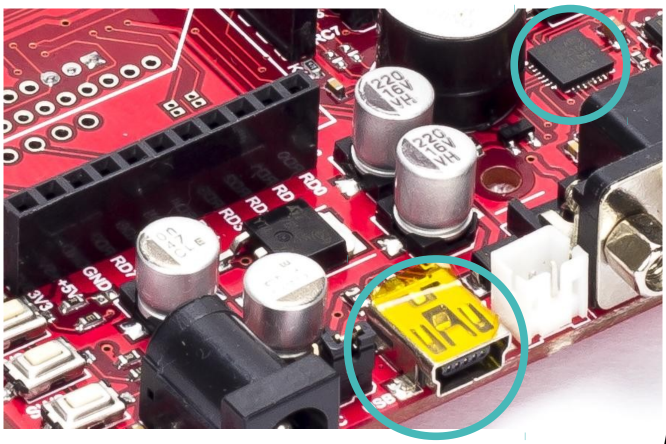


Illustration 12: CP2102 Module

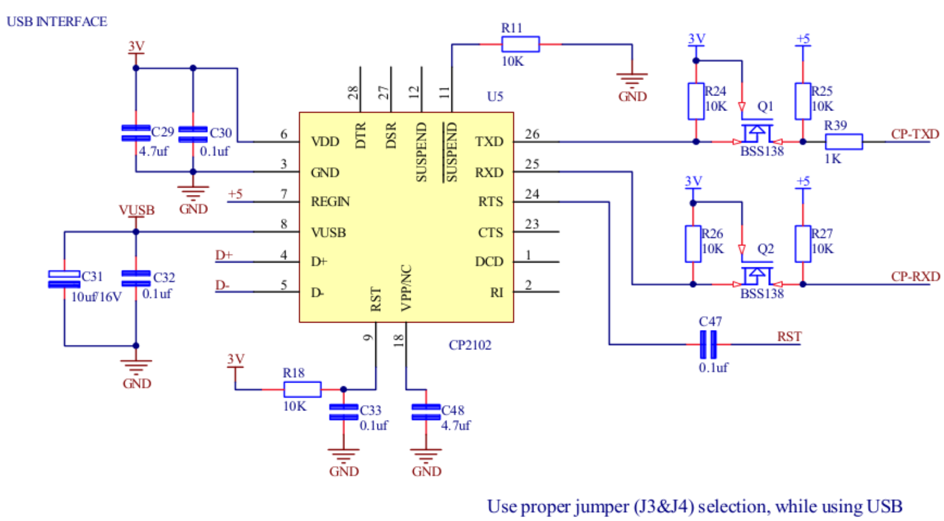


Illustration 13: CP2102 Module schematic

USING REALTERM IN PC

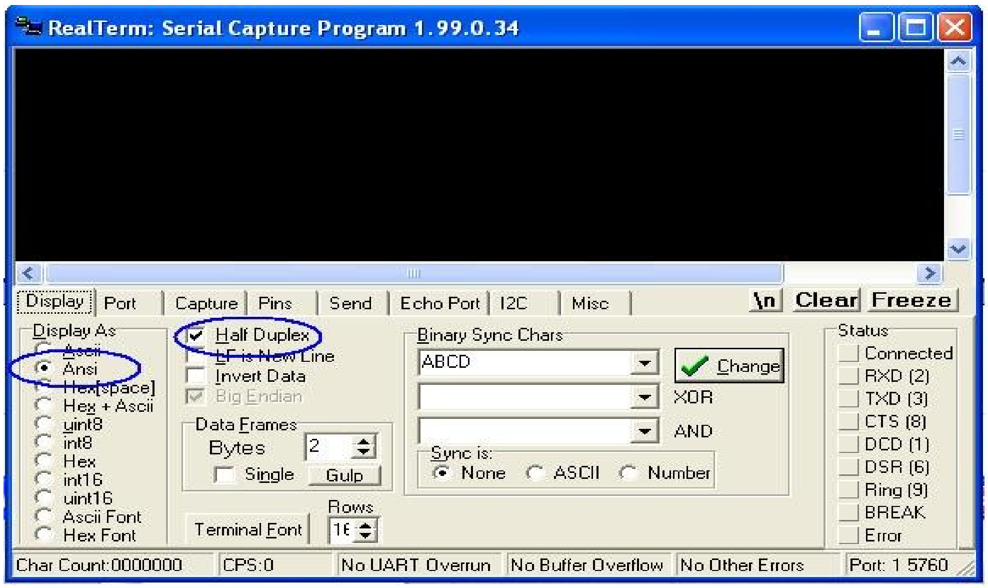
Real term is a testing, analyzing and simulation tool for serial communication protocols. It allows us to monitor communication between two serial devices or to test the serial communication of a single devices. **Realterm** can be download by (download)

Steps for creating RealTerm in PC

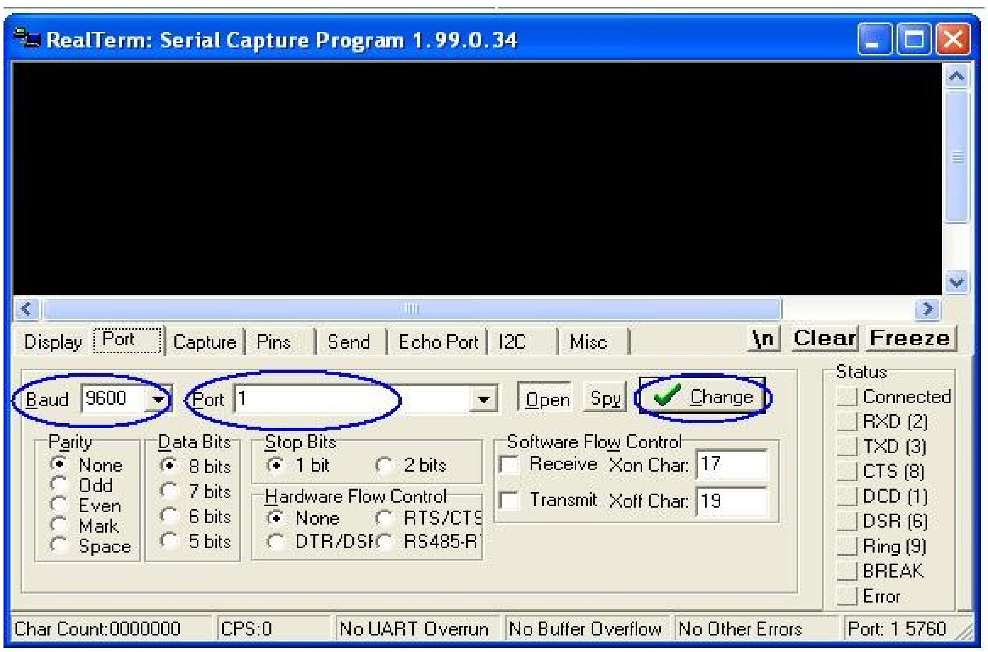
The serial data transmitted through USART can be viewed on a PC using a Windows tool for Serial Port Communication called Realterm.

Step 1: All program ⇨ RealTerm ⇨ realterm

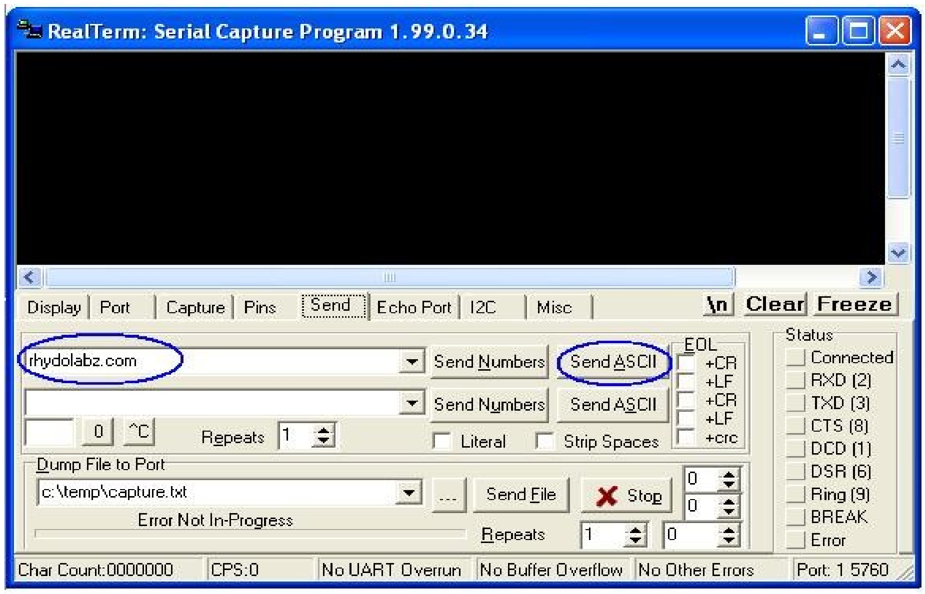
Step 2: ***Display Tab***- **Here the output text format selected is ANSI and Half Duplex mode is enabled to view the data sent by the user.**



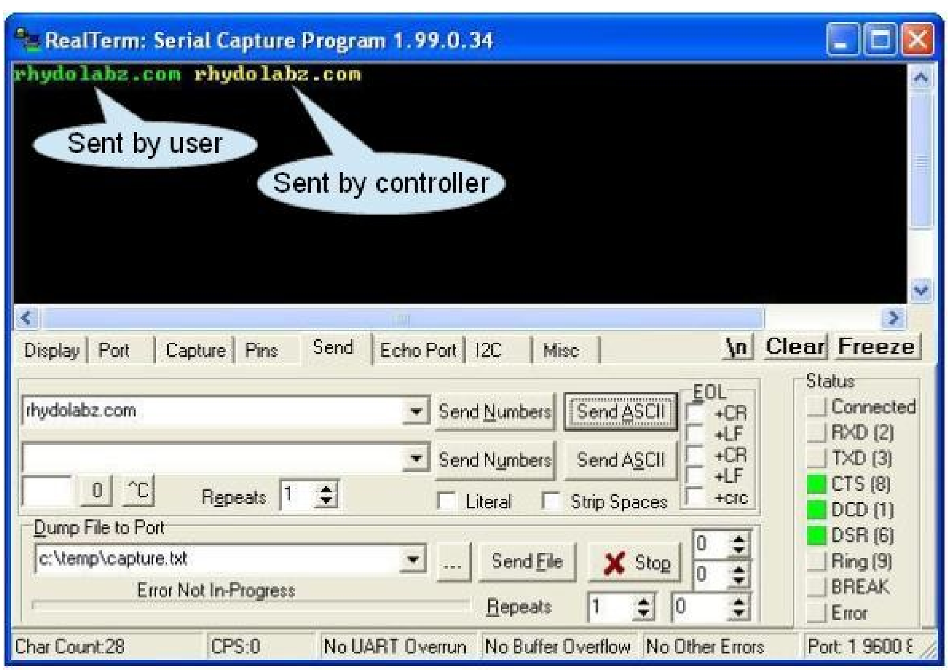
Step 3: ***Port Tab***-To test the connection **-** make sure the **Open** button is pressed, Select required baud rate and the “Port” dropdown here, select the number of your COM port and then press the **Change** button.



Step 4: Send Tab- Insert the desired data to be transmitted and press "Send ASCII" button.



Step 5 : The output after data transmission to the controller is shown in the following diagram. The text sent by user and controller is highlighted by callouts in the figure.



2.11. 5V UART

5V UART can be used to interface 5V TTL modules to communicate with microcontroller.

Eg:- RFID, Bluetooth etc

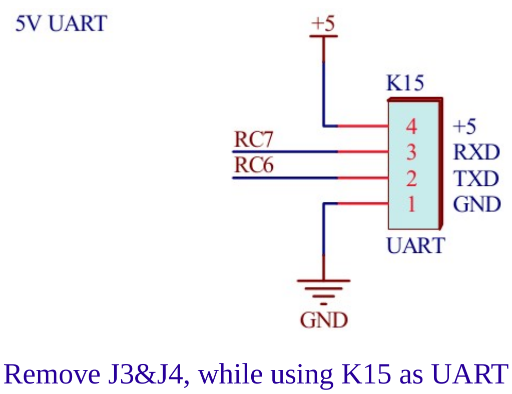


Illustration 14: 5V UART Schematic

Illustration 15: 5V UART pins

2.12. 3V3 UART

3V3 UART can be used to interface 3V3 TTL modules to communicate with microcontroller.
Eg:- ZigBee, BlueBee etc

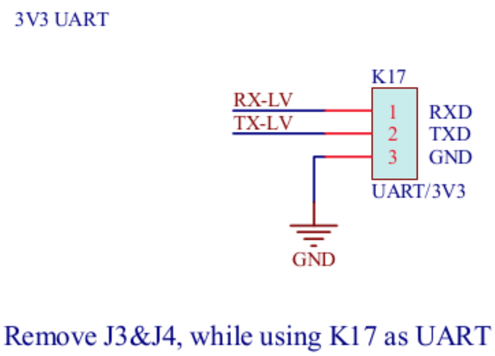


Illustration 16: 3V3 UART Schematic

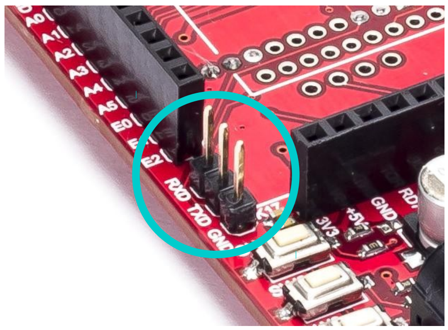
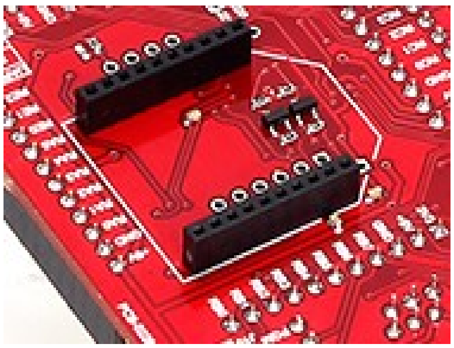


Illustration 17: 3V3 UART pins

2.13. ZIGBEE INTERFACING

ZigBee is a wireless networking standard that is aimed at remote control and sensor applications which is suitable for operation in harsh radio environments and in isolated locations. ZigBee technology builds on IEEE standard 802.15.4. rhydoLABZ PIC16F877A development board(mini) have pin-out compatibility for ZigBee interfacing. Communication with the ZigBee module uses a standard UART interface compatible with 3V3. Short J20 and J21 while using ZigBee.



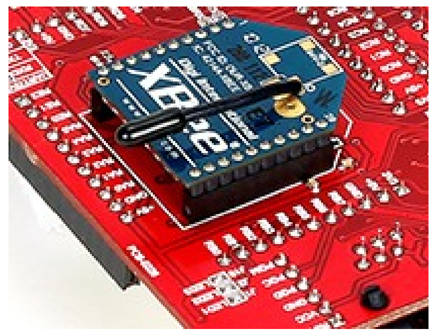


Illustration 22: ZigBee Module mounted on board

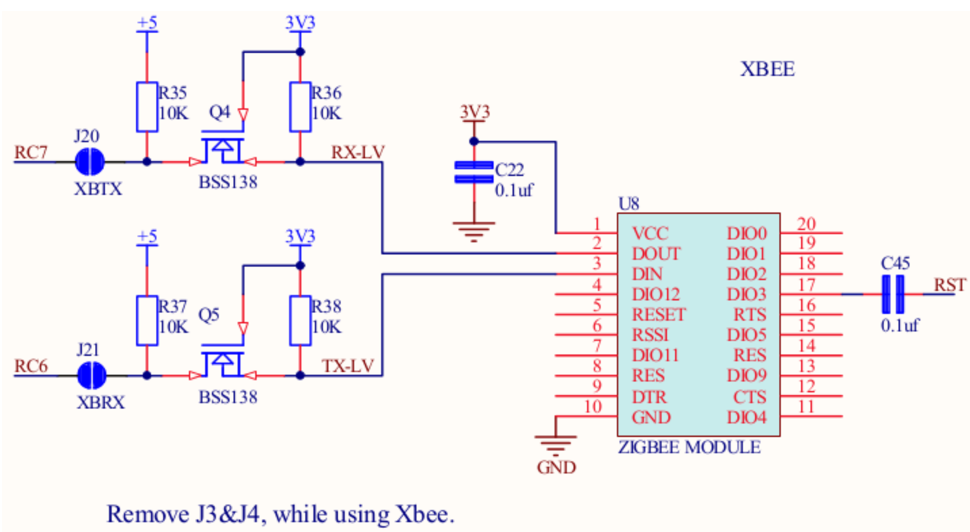


Illustration 23: ZigBee Module Schematic

2.14. RFID INTERFACING

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. The RFID device serves the same purpose as a bar code or a magnetic strip on the back of a credit card or ATM card; it provides a unique identifier for that object. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader and may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture(AIDC) . RFID is a method of identifying unique items using radio waves. Typical RFID systems are made up of three components: readers (interrogators), antennas and tags (transponders) that carry the data on a microchip.

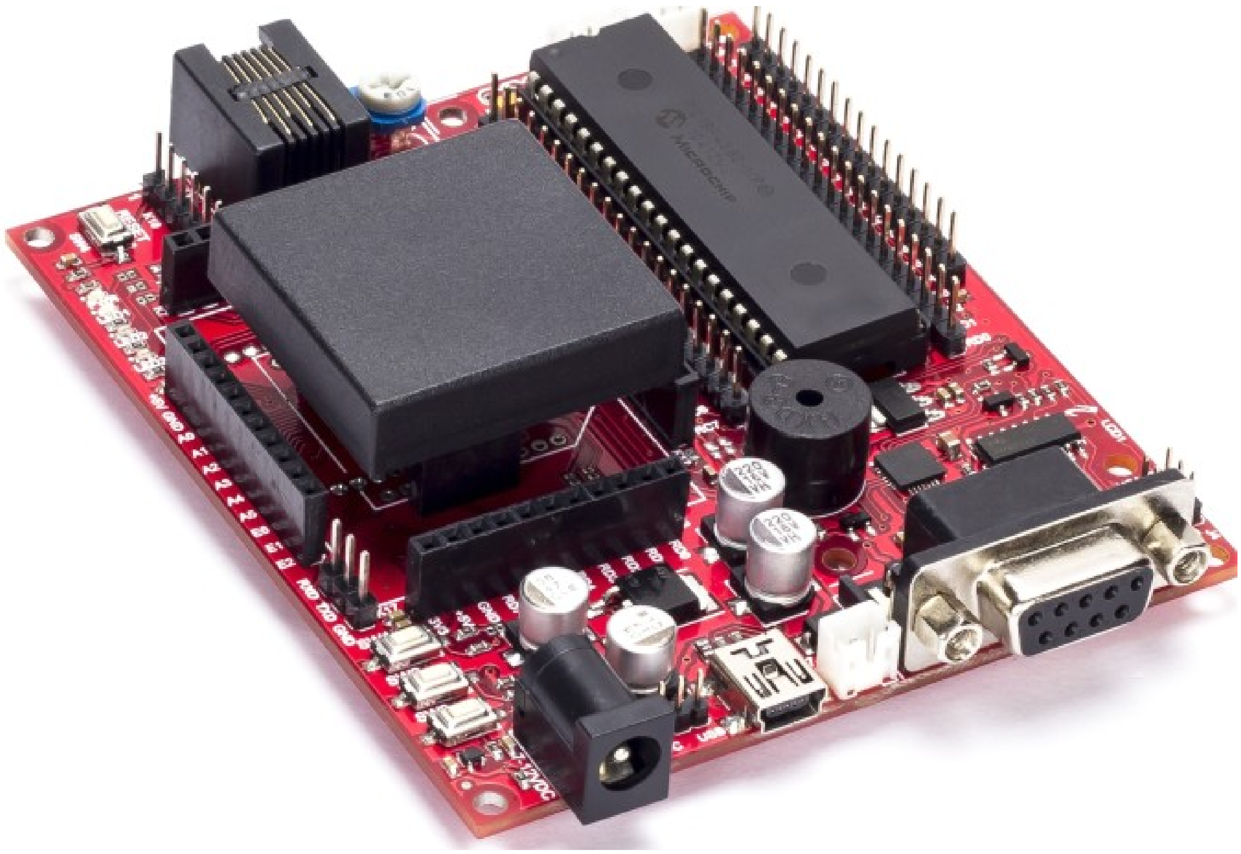


Illustration 30: RFID Reader on board

Illustration 31:RFID Tags

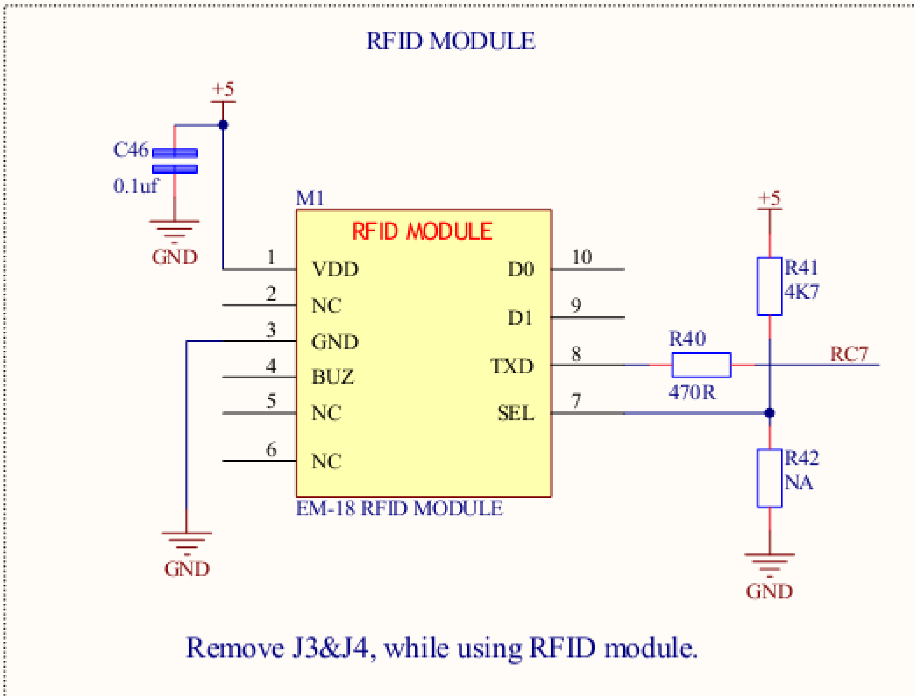


Illustration 32:RFID Interfacing Schematic

2.15. ANALOG-TO-DIGITAL CONVERTER

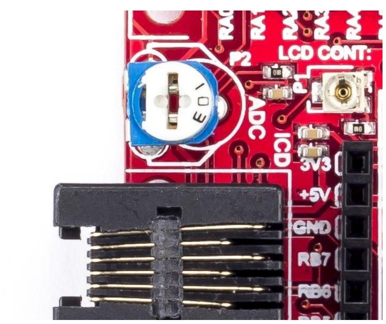
The Analog-to-Digital Converter module in PIC16F877A has eight analog inputs . The analog input charges a sample and hold capacitor . The output of the sample and hold capacitor is the input into the converter. The converter then generates a digital result of this analog level via successive approximation . The A/D conversion of the analog input signal results in a corresponding 10-bit digital number. The A/D module has four registers. These registers are:

- A/D Result High Register(ADRESH)
- A/D Result Low Register(ADRESL)
- A/D Control Register0(ADCON0)
- A/D Control Register1(ADCON1)

Analog pin RA0 connected to a potentiometer

A potentiometer in an electrical device allows reducing the voltage level from the circuit maximum to ground, or zero level. The test input voltage for ADC is derived from a 10K potentiometer connected across the +5V power supply, and is connected to RA0/AN0 pin of PIC16F877A. Therefore, the 10-bit ADC will convert any analog voltage between 0-5V to a digital number ranging from 0-1023. The number will be displayed on the LCD. The device that performs either conversion is called an A/D or analog-to-digital converter.

Illustration 18: Potentiometer for ADC



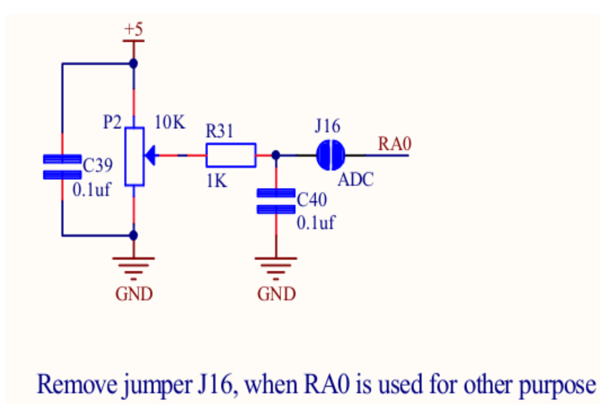


Illustration 19: Potentiometer for ADC Schematic

Analog pin RA1 interfaced to a Temperature sensor

MCP9700 temperature sensor can be used to measure ambient temperature, in the range of -55C to 150C.

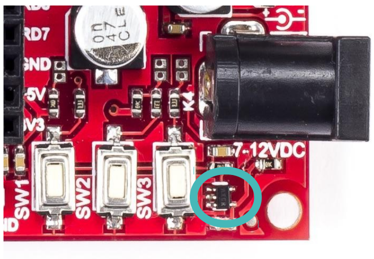


Illustration 20:Temperature Sensor on board

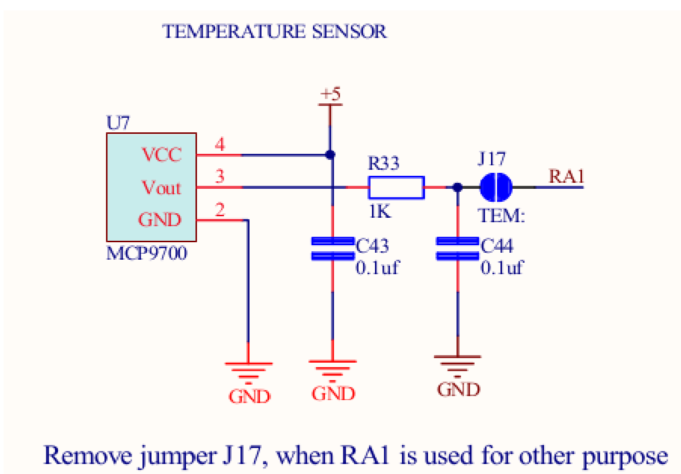


Illustration 21:Temperature Sensor Schematic

2.16. ICSP CONNECTOR AND RJ-11 PINOUT

In-Circuit Serial Programming, is the ability of some programmable devices, microcontrollers and other embedded devices to be programmed while installed in a complete system. This is a Six PIN male connector used to upload/debug programs to microcontroller. Pinout of RJ-11 is same as that of ICSP , so it can be used for debugging/programming the controller.

Signals and pinout

- **Vpp** - Programming mode voltage. This must be connected to the MCLR pin, or the Vpp pin of the optional ICSP port available on some large-pin count PICs. To put the PIC into programming mode, this line must be in a specified range that varies from PIC to PIC. For 5V PICs, this is always some amount above Vdd, and can be as high as 13.5V. The 3.3V only PICs like the 18F, 24H, and 33F series use a special signature to enter programming mode and Vpp is a digital signal that is either at ground or Vdd. There is no one Vpp voltage that is within the valid Vpp range of all PICs. In fact, the minimum required Vpp level for some PICs can damage other PICs.
- **Vdd** - This is the positive power input to the PIC. Some programmers require this to be provided by the circuit (circuit must be at least partially powered up), some programmers expect to drive this line themselves and require the circuit to be off, while others can be configured either way (like the Microchip ICD2). The Embed Inc programmers expect to drive the Vdd line themselves and require the target circuit to be off during programming.
- **Vss** - Negative power input to the PIC and the zero volts reference for the remaining signals. Voltages of the other signals are implicitly with respect to Vss.
- **ICSPCLK** - Clock line of the serial data interface. This line swings from GND to Vdd and is always driven by the programmer. Data is transferred on the falling edge.
- **ICSPDAT** - Serial data line. The serial interface is bi-directional, so this line can be driven by either the programmer or the PIC depending on the current operation. In either case this line swings from GND to Vdd. A bit is transferred on the falling edge of PGC.

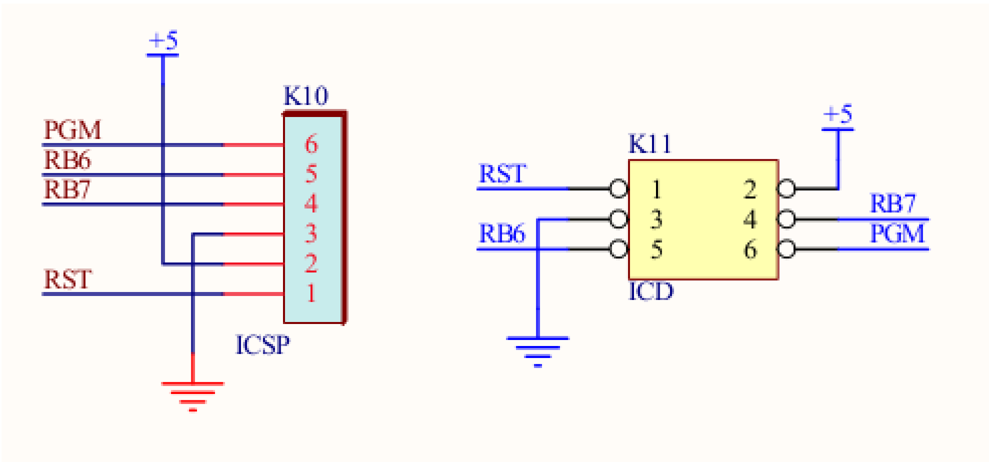


Illustration 24:ICSP Port and RJ-11 Port Schematic

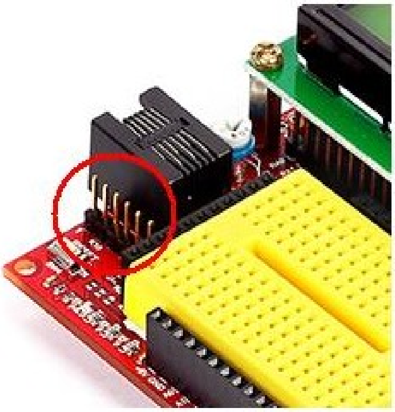


Illustration 24:ICSP Port on Development Board-mini

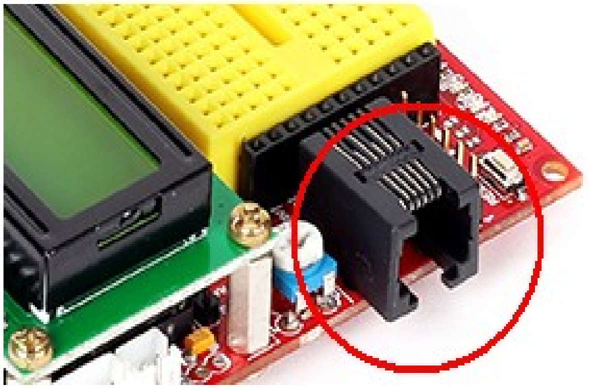


Illustration 25:Rj-11 Pinout

2.17. SERVO MOTOR INTERFACING

A servomotor is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. Servomotors are controlled by sending an electrical pulse of variable width, or pulse width modulation (PWM), through the control wire. There is a minimum pulse, a maximum pulse and a repetition rate. Here the control line is connected to the RE1 pin of the microcontroller. The control signal can be created by using by timers with required duty cycle .

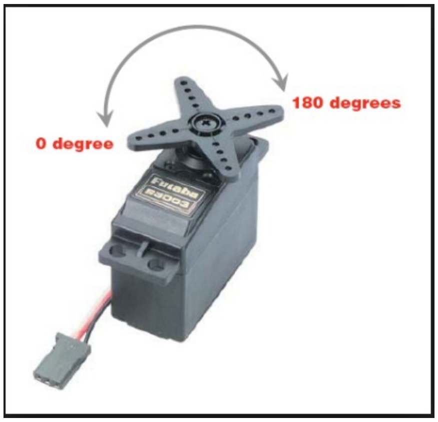


Illustration 26:Servo motor

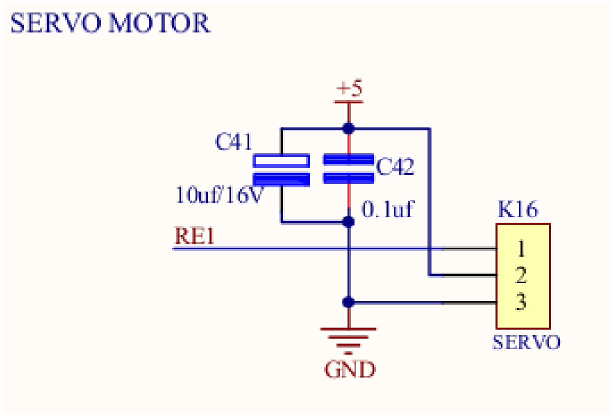


Illustration 27:Servo motor connector Schematic

2.18. PORT EXPANDER(ADDITIONAL INPUT/OUTPUT PORTS)

The PIC16F877A development board- has all port pins available at direct port access connectors(male & female). The connections are as given below.

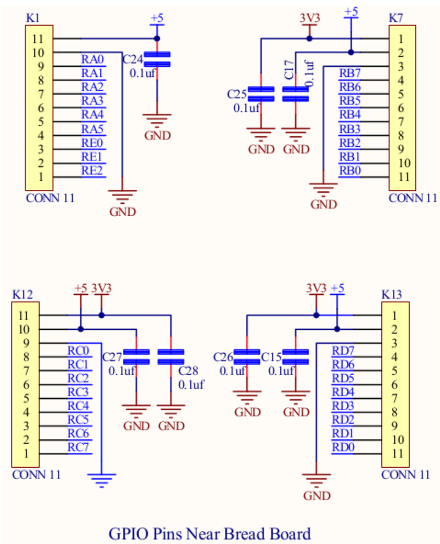


Illustration 33:GPIO near breadboard Schematic

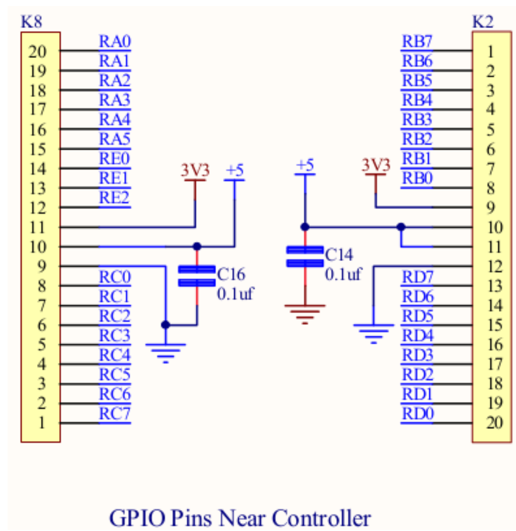


Illustration 34:GPIO near controller Schematic

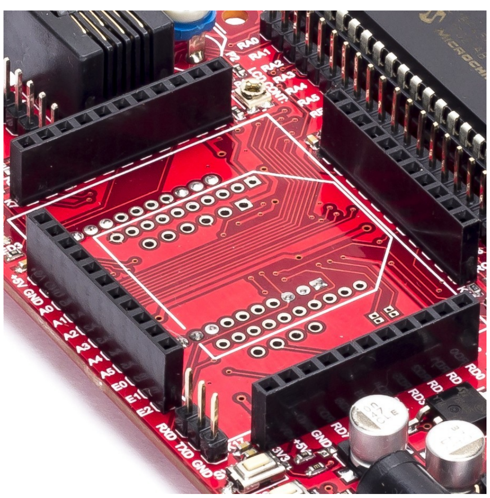


Illustration 35:GPIO near breadboard

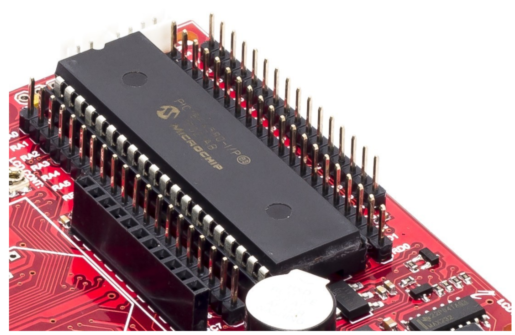


Illustration 36:GPIO near controller

SOFTWARE DEVELOPMENT

3.1. TOOLS AND SOFTWARE

To get started with PIC microcontrollers we will need some tools and software:

- A PC, desktop or laptop with a spare USB port, running Windows 7 or XP.
- Microchips MPLAB Integrated Development Environment.
- A C compiler
- A PIC programmer, to load your programs onto the microcontroller without bootloader.
- A prototyping environment, such as rhydoLABZ PIC16F877A Microcontroller Development Boards.

The MPLAB development system consists of a system of programs that run on a PC. This software package is designed to help develop, edit, test, and debug PIC code. Installing the MPLAB package is straightforward and simple.

Familiarization of MPLAB LITE Development Suite

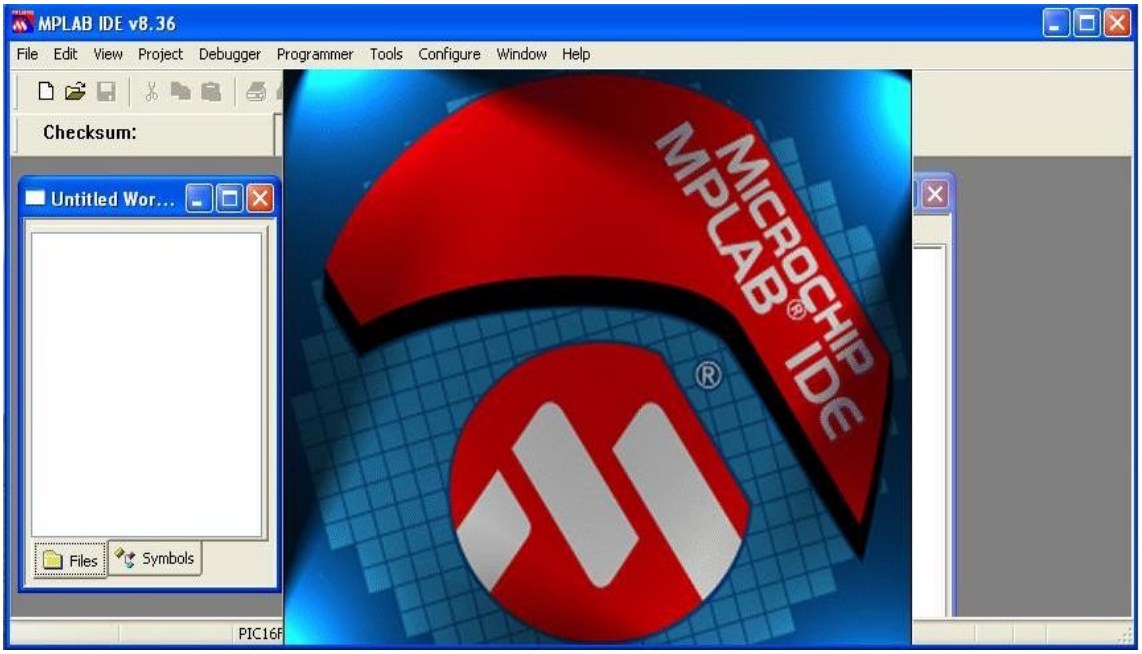
- Creating a Project file
- Select Microcontroller from Device Database
- Copy and Add the CPU Startup Code
- Create New Source Files
- Add Source Files to Project
- Set Tool Options for Target

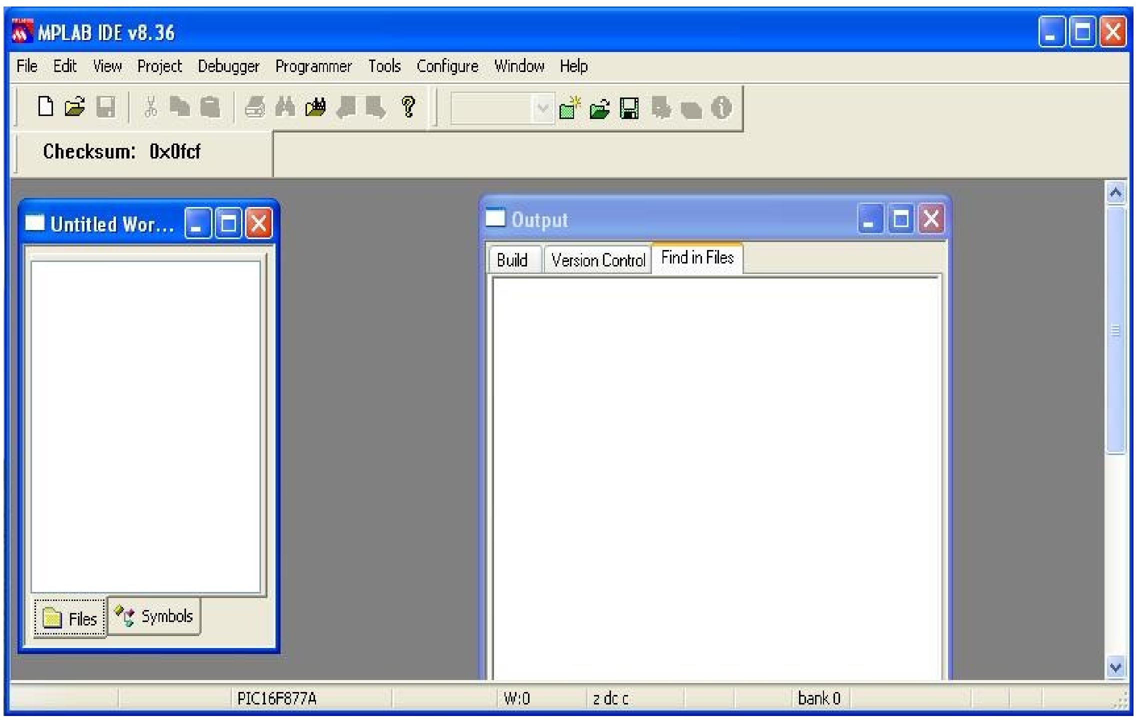
3.2. HOW TO TEST?

Mini USB and Serial Cable are used for programming the Development board -Mini. When USB cable is connected to the Development board -Mini, “PWR LED”(Red) on the top of Development board -Mini module glows, which shows the power indication.

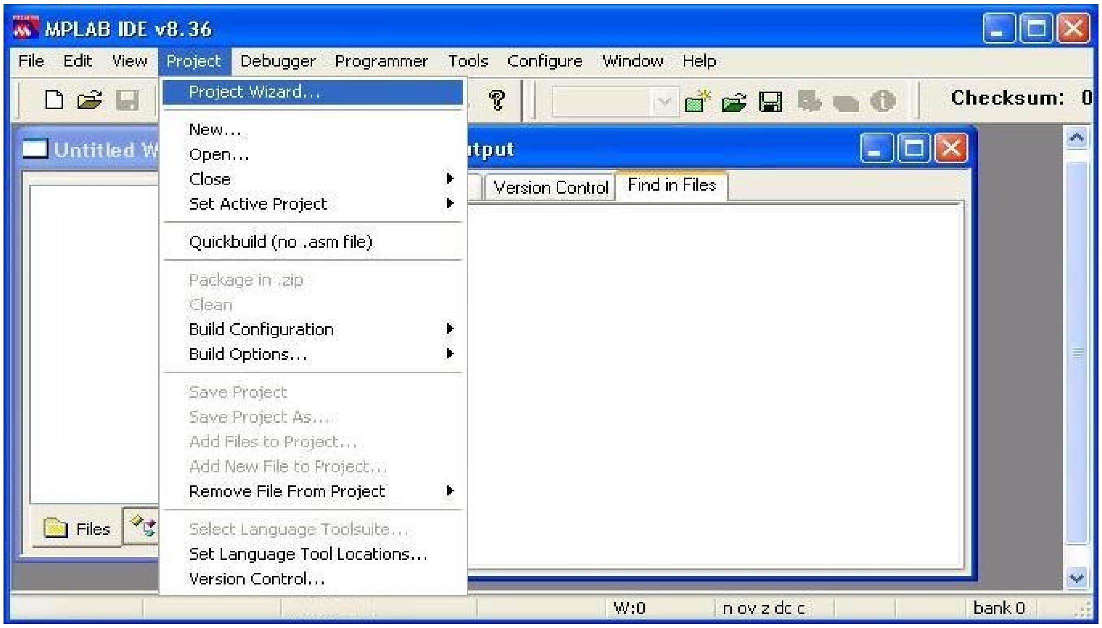
Step 1 : Launch MPLAB IDE

Step 2 : The MPLAB IDE window opens as shown below

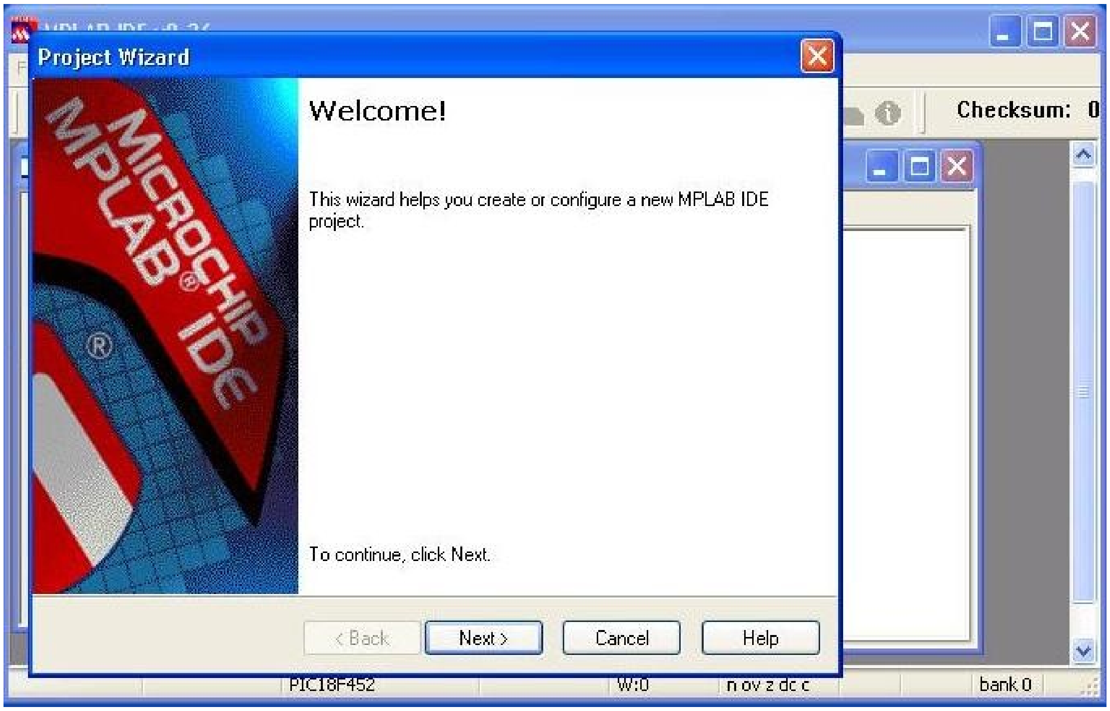




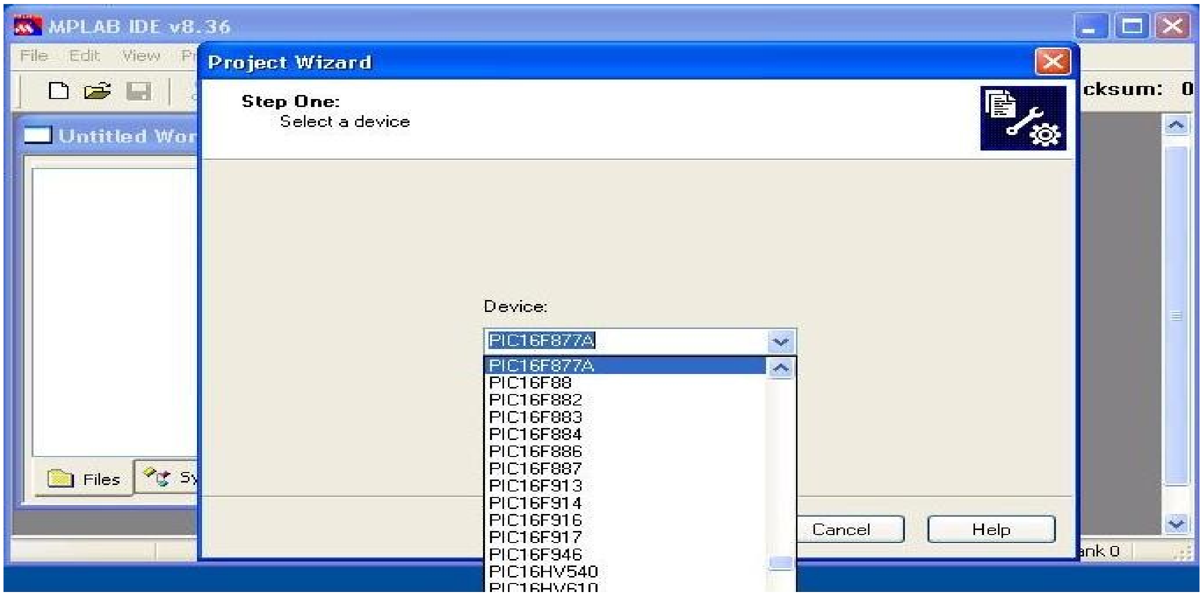
Step 3 : To create a new project, select ***Project > Project Wizard*** from menu bar



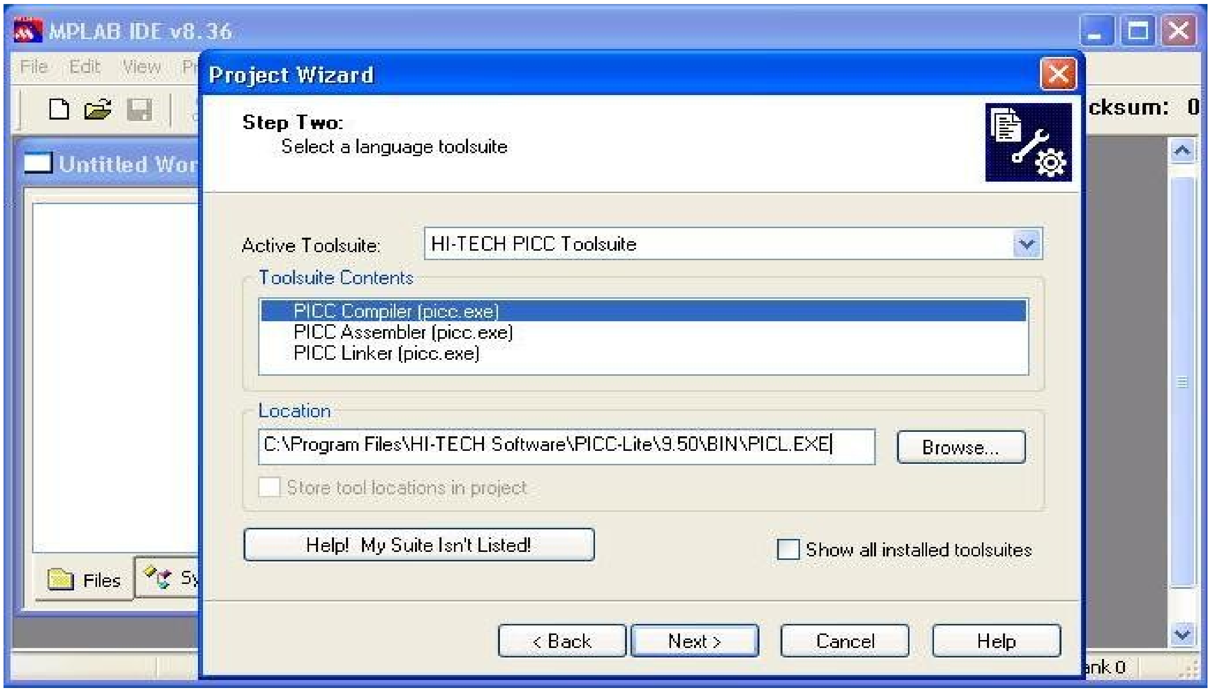
Step 4 : Click 'Next' to the poped up ***Project Wizard*** window



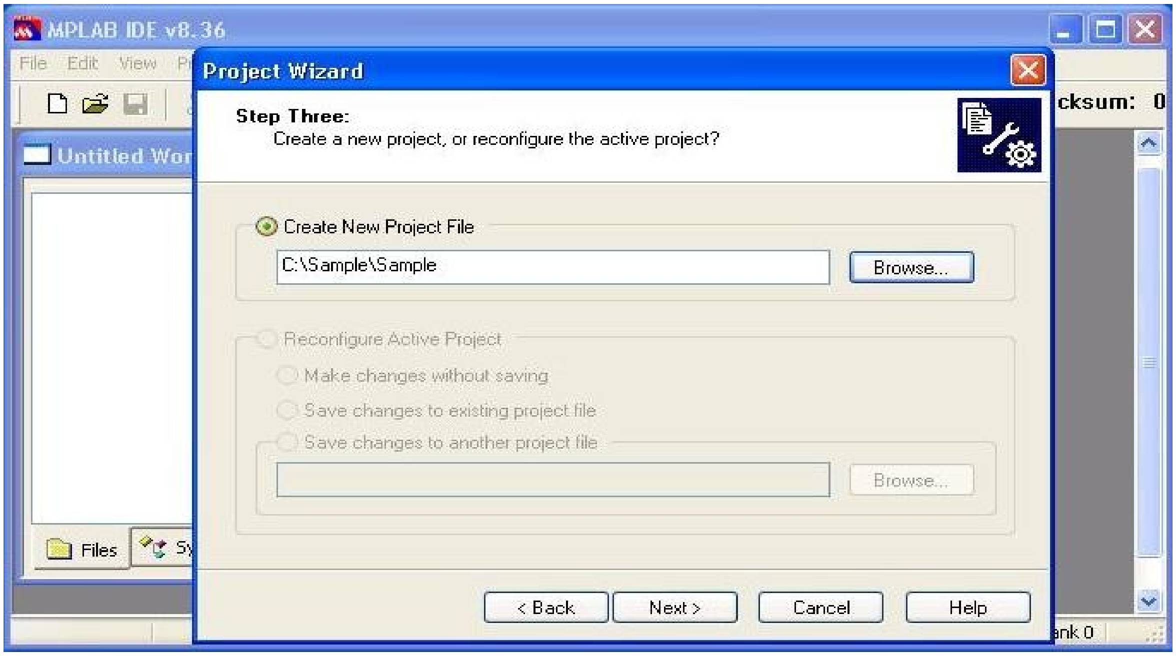
Step 5: Select **PIC16F877A** from the drop-down list appears in the window opens



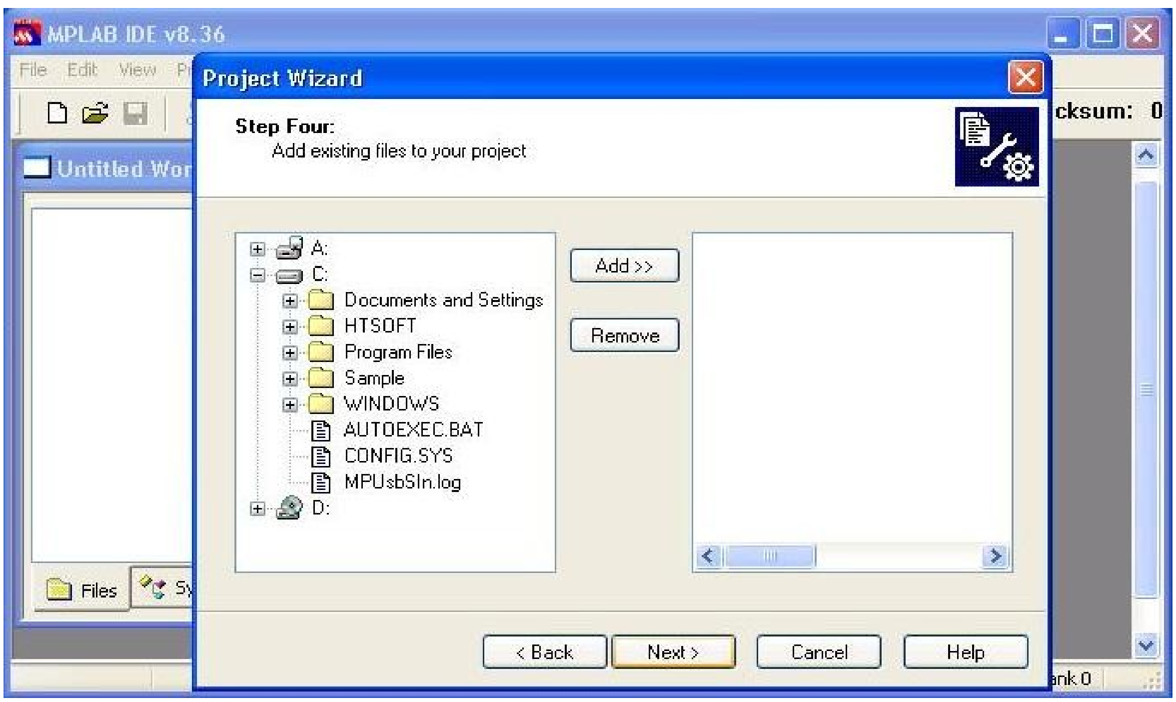
Step 6: Select **HI-TECH PICC TOOL suite** as compiler among the list of toolsuite given. Check the toolsuite content listed contains PICC Compiler suiting to our programming needs. And click next.



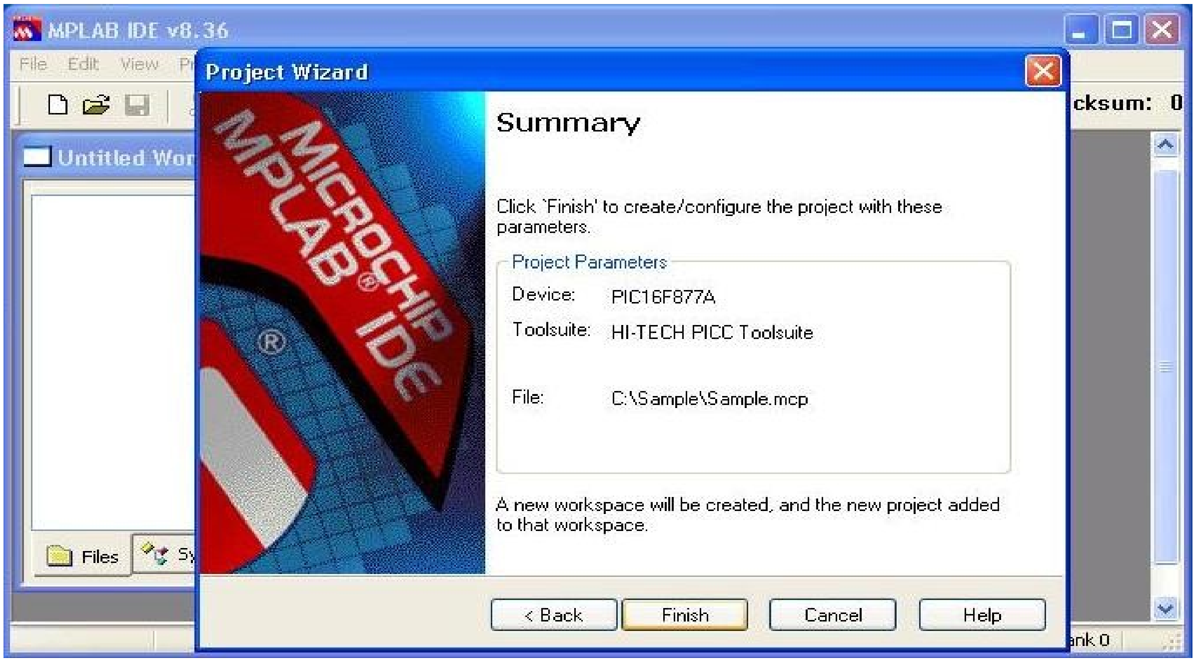
Step 7: Create a project file at desired name in a suitable location with appropriate name



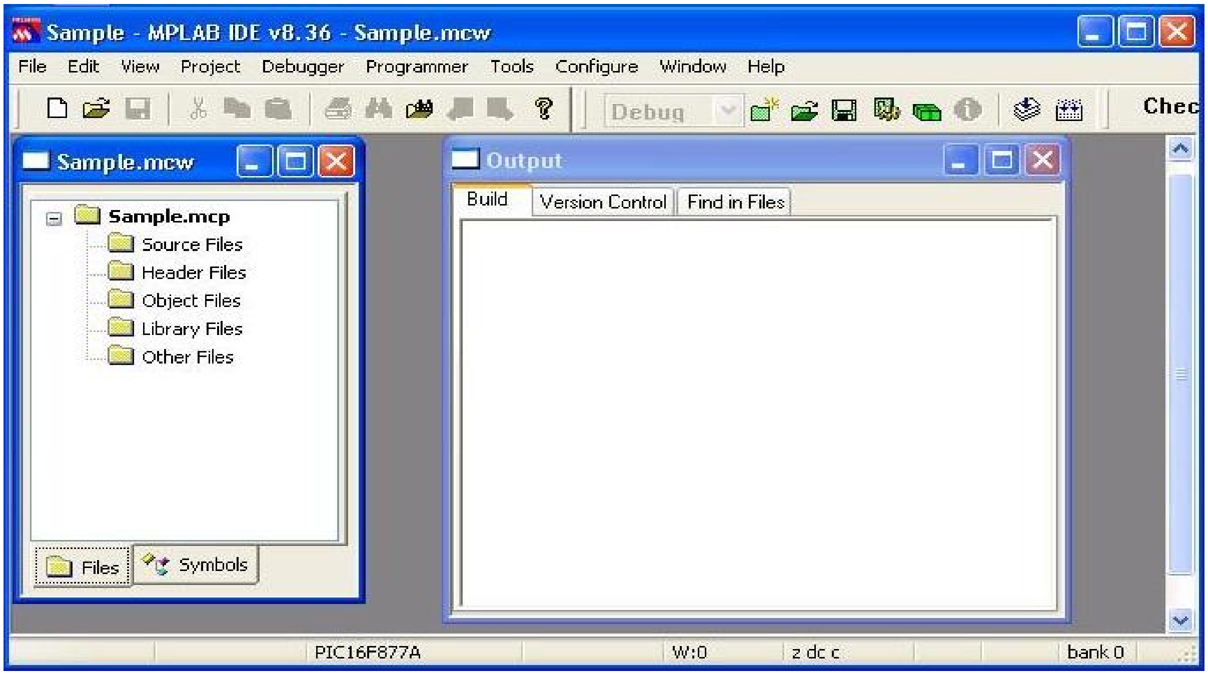
Step 8: In next window open, add any files you desire to add to your new project,if required. else just skip this step by clicking '**Next**'.



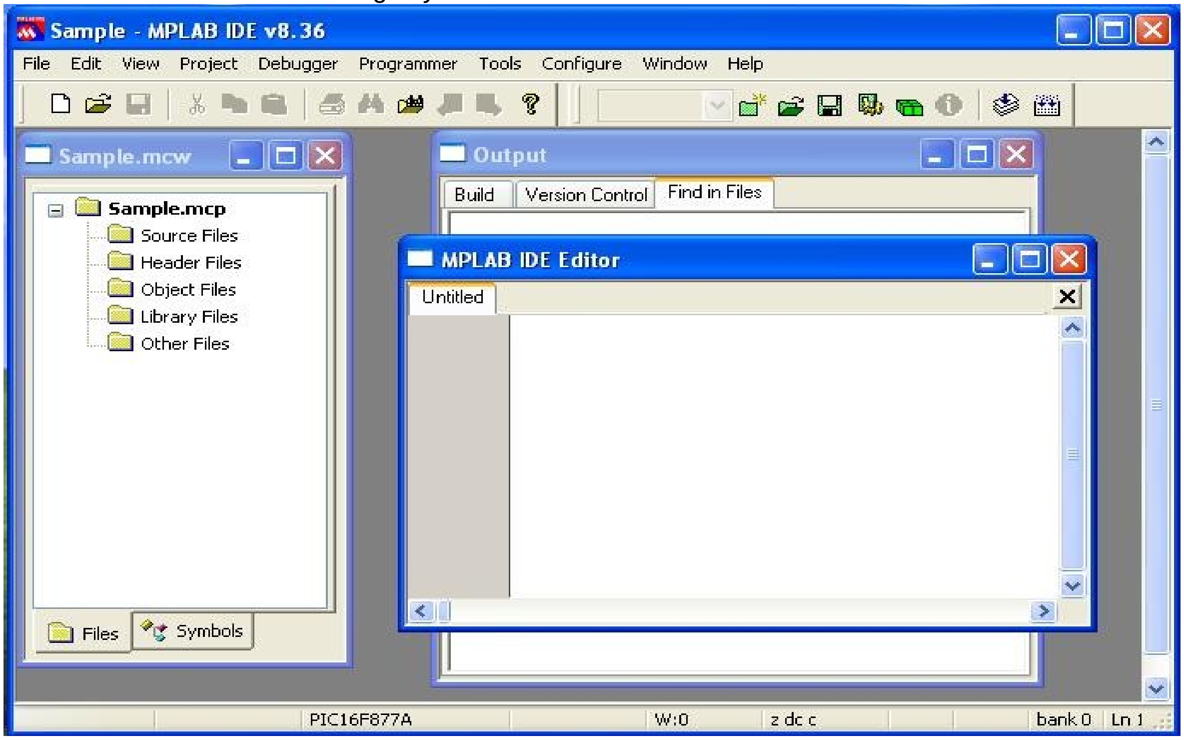
Step 9: Click **Finish** to the following window open.



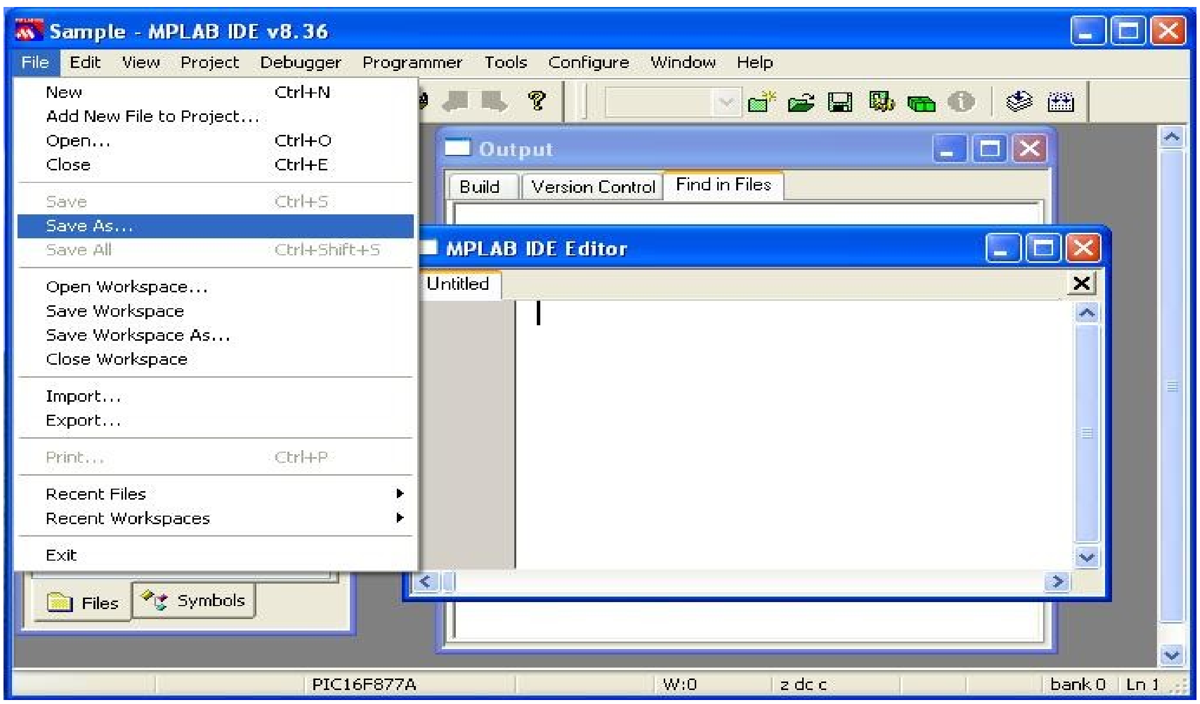
Step 10: After creating project the following window open.



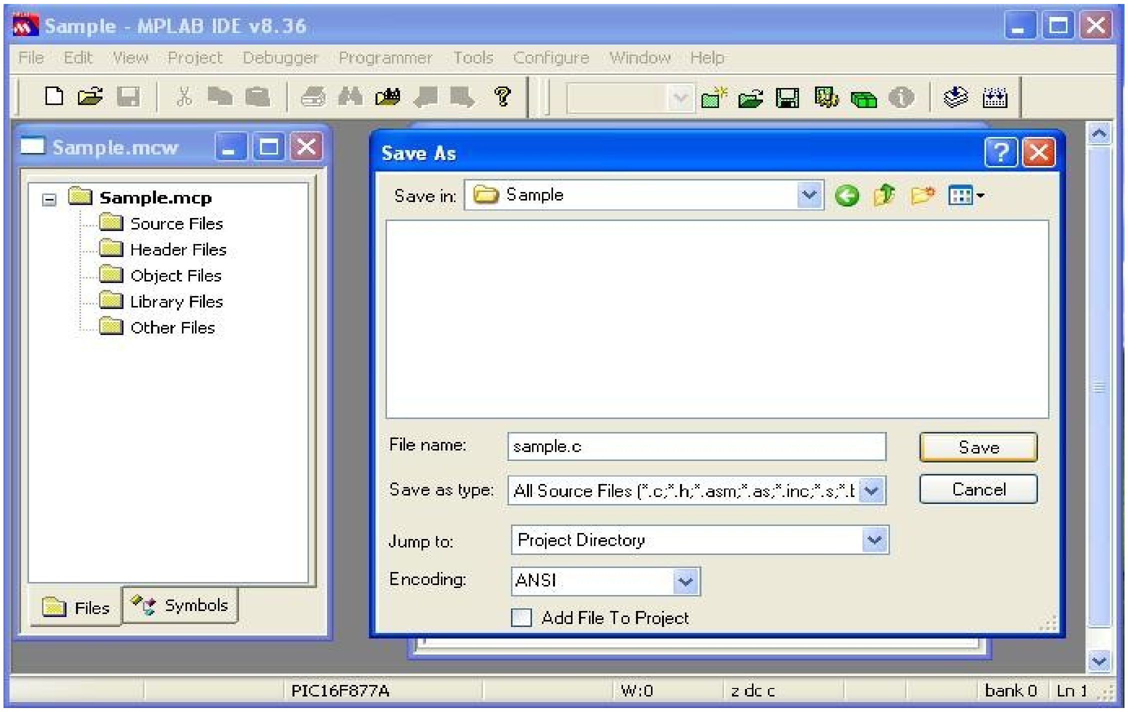
Step 11: Create a new file either by clicking the New File icon, or by selecting ***File > New*** or using keyboard shortcut CTRL + N.



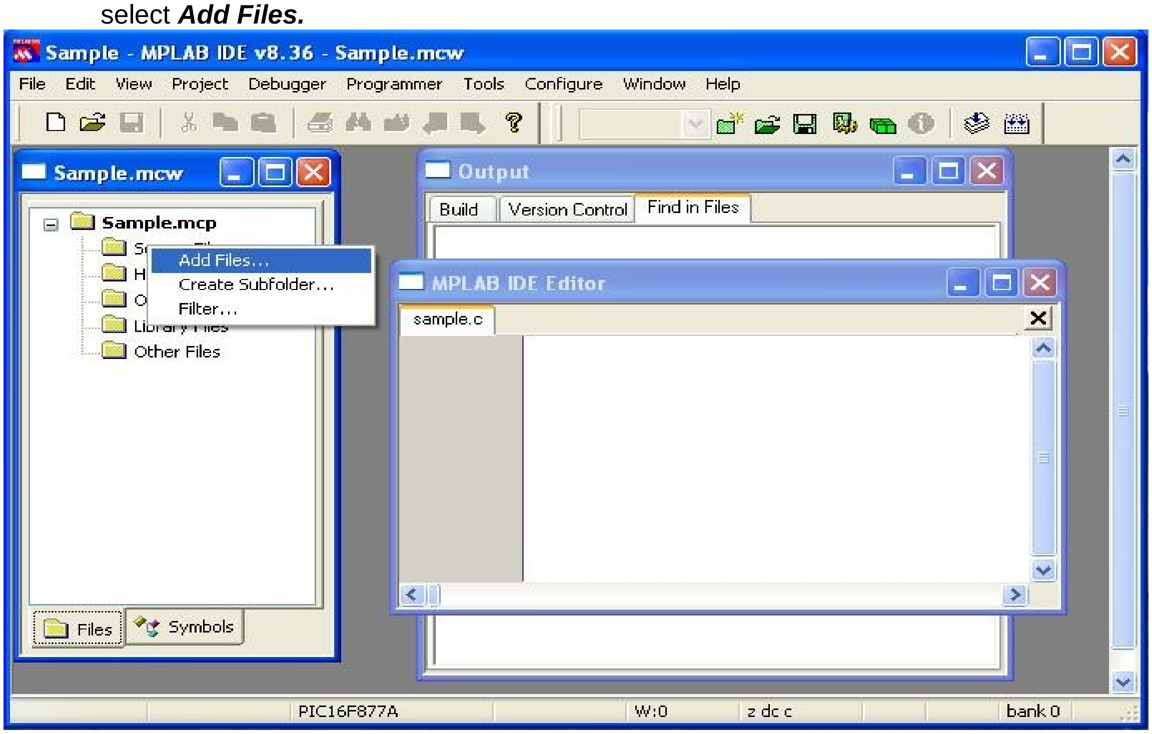
Step 12: Created file was saved by selecting ***File>Save as***



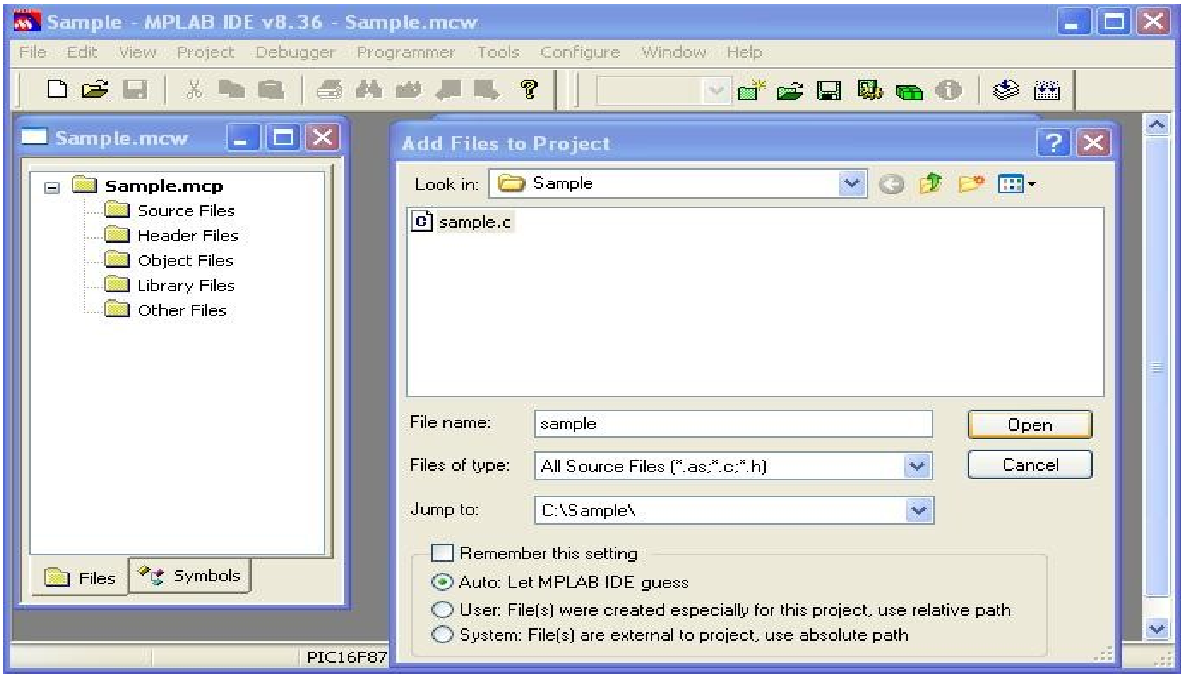
Step 13: Save the file with **.c** extension in the project folder



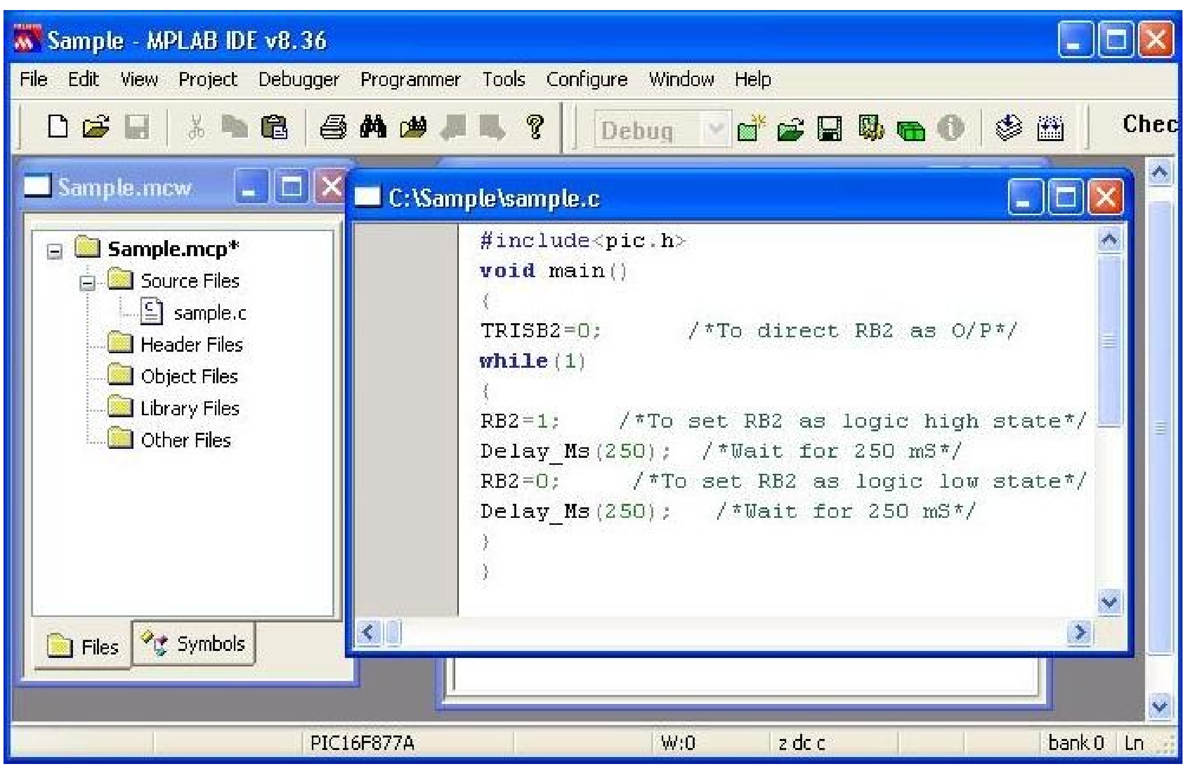
Step 14: Saved file can be added to source file by right click on source file and select ***Add Files.***



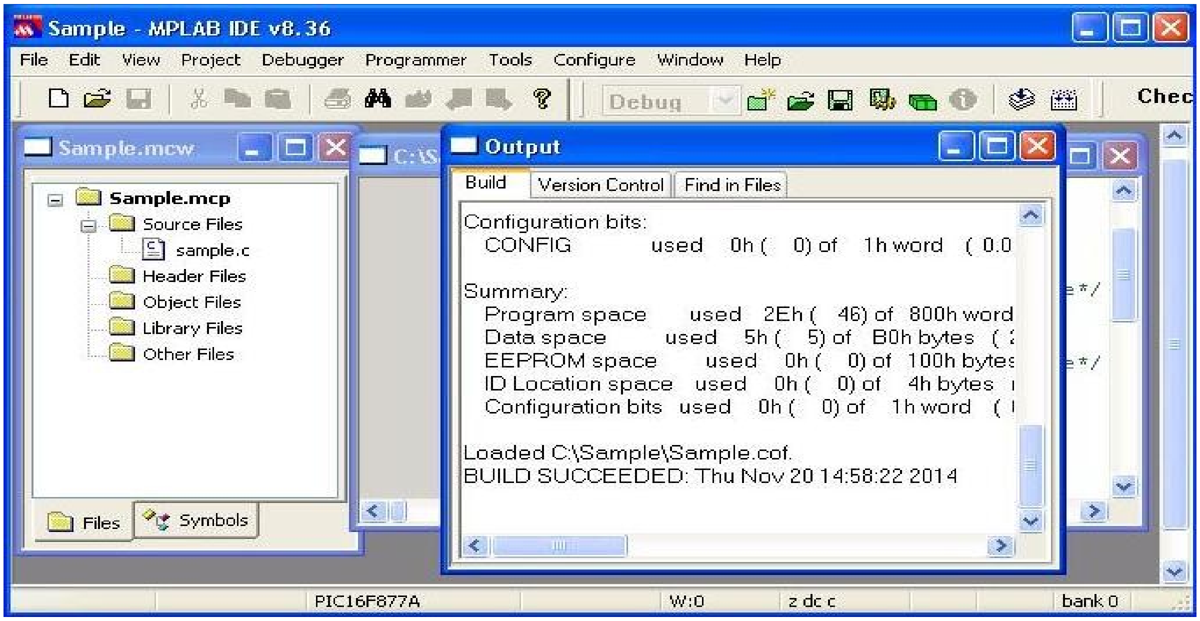
Step 15: Select ***sample.c*** from the new window opened and click ***Open.***



Step 16: Type the ***code.***



Step 17: Code can be compile by clicking the ***Build All*** icon. Build the project. Errors (if any) get listed in the Build output window. Correct them and build again. On successful building, the hex file will be generated in the project folder.



Tiny Bootloader

This is a bootloader for Microchip PIC microcontroller . By using Tiny Bootloader , program can be upload to the flash memory of the controller. The communication settings can be editable, so we can write any COM and desired baud rate. Works with PIC16F,PIC18F and automatically detects HEX content.

Now the code can be flashed to the controller.
In the board, make sure to do the following jumper connections

(1) Select the power source as USB cable or DC source.
(2) Select USB or serial port for flashing the code.

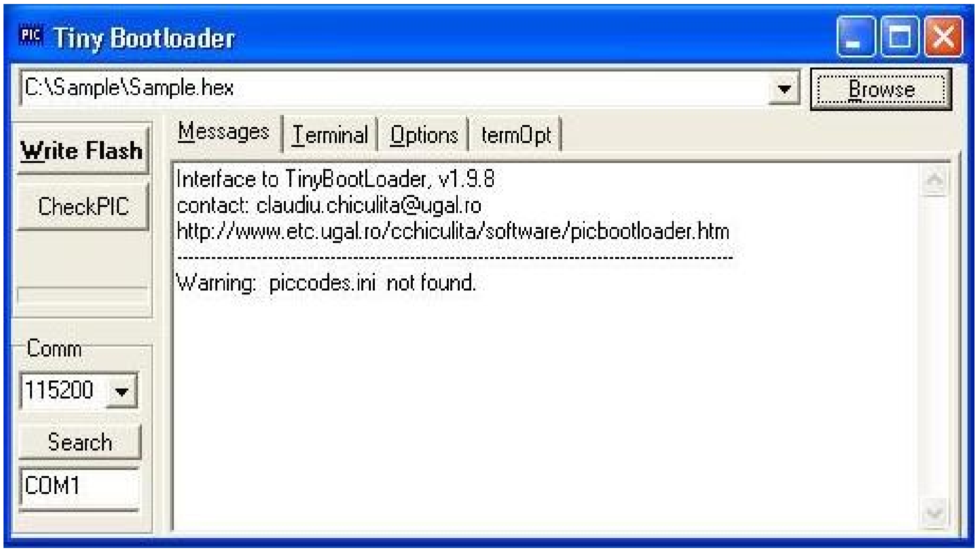
Now power up the board. The power LED on the board glows.

Note: The controller can be programmed in two ways

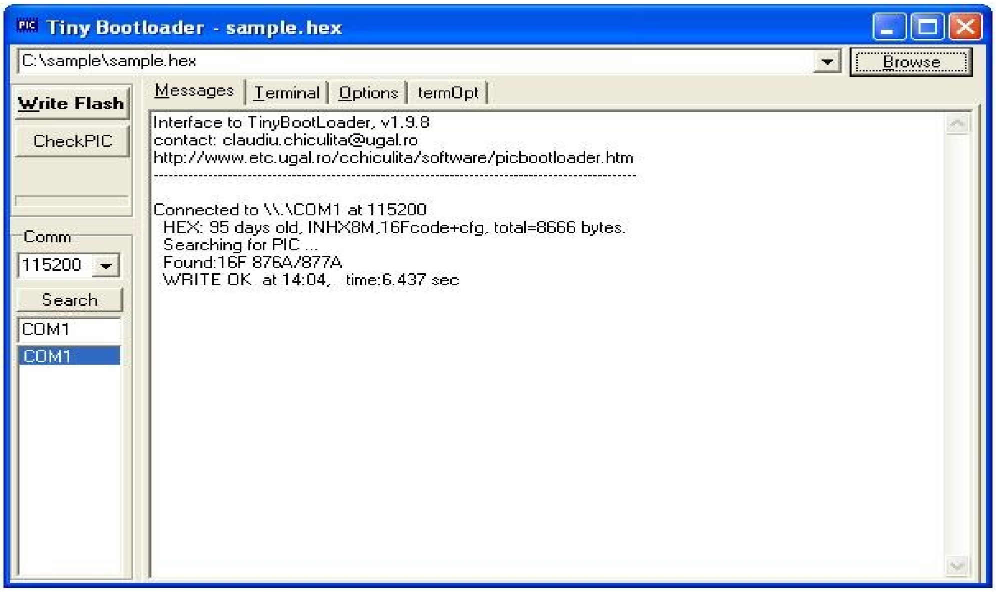
1. By using Serial Port
2. By using USB Port

The user has to choose the exact COM Port in order to program the controller either through Serial Port or through USB Port.

Step 18: Open Tiny Bootloader . Load required hex file.



Step 19: Click ***Write Flash*** and simultaneously press ***Reset button*** on development on development board. After successfully flashing the code into the controller, it can be used for the desired purpose.



I/O DISTRIBUTION

4.1. THE PIN DISTRIBUTION OF PIC16F877A DEVELOPMENT BOARD

Pin No:	Name	Type	The I/O assign of PIC16F877A Development Board
1	MCLR/VPP	-	Reset Key
2	RA0/AN0	I/O	ADC Input (potentiometer)
3	RA1/AN1	I/O	ADC Input (Temp Sensor)
4	RA2/AN2/VREF-	I/O	N/C
5	RA3/AN3/VREF+	I/O	N/C
6	RA4/T0CKI	-	N/C
7	RA5/AN4/SS	I/O	N/C
8	RE0/RD/AN5	I/O	BUZZER
9	RE1/WR/AN6	I/O	SERVOMOTOR
10	RE2/CS/AN7	I/O	N/C
11	VDD	-	5V (Vcc)
12	VSS	-	GND
13	OSC1/CLKIN	-	-
14	OSC2/CLKOUT	-	-
15	RC0/T1OSO/T1CKI	I/O	LCD
16	RC1/T1OSI/CCP2	I/O	LCD
17	RC2/CCP1	I/O	Pull-Up Key
18	RC3/SCK/SCL	I/O	Pull-Up Key
19	RD0/PSP0	I/O	LCD
20	RD1/PSP1	I/O	LCD
21	RD2/PSP2	I/O	LCD
22	RD3/PSP3	I/O	LCD
23	RC4/SDI/SDA	I/O	N/C
24	RC5/SDO	I/O	N/C
25	RC6/TX/CK	I/O	TXD/ XBEE/RFID
26	RC7/RX/DT	I/O	RXD /XBEE/RFID
27	RD4/PSP4	I/O	LCD

28	RD5/PSP5	I/O	LCD
29	RD6/PSP6	I/O	LCD
30	RD7/PSP7	I/O	LCD
31	VSS	-	GND
32	VDD	-	5V (Vcc)
33	RB0/INT	I/O	N/C
34	RB1	I/O	LED
35	RB2	I/O	LED
36	RB3/PGM	I/O	LED
37	RB4	I/O	N/C
38	RB5	I/O	Pull-Up Key
39	RB6/PGC	I/O	ICSP
40	RB7/PGD	I/O	ICSP

TECHNICAL SUPPORT

If you are experiencing a problem that is not described in this manual, please contact us. Our phone lines are open from 9:00 AM – 5.00 PM (Indian Standard Time) Monday through Saturday excluding holidays. Email can be sent to support@rhydolabz.com

DISCLAIMER

Contact Us

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